September, 1946 Vol. 35, No. 7

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

SCHOOL OPENING NUMBER

The Shop Teachers' Professional Magazine

Photocourtesy General Electric Company. The powder that lights up this girl's face is a phosphor which inside a fluorescent tube transforms invisible ultraviolet rays into visible light . . . for better seeing.

Better Light for Better Sight

Just as the process of illumination is the casting of light vibrations on an object so that its reflected rays impinge on the rods and cones of the eyes . . . so the process of education—on the cones and rods of the soul.

Just as the brighter the light the better the seeing . . . so the greater the illumination the educator can cast the more the likelihood that his students will see.

To make youngsters see . . . that *must* be the process of education in a democracy. To give them a clear vision of what lies ahead, to show alike the possibilities of the world outside and the possibilities within themselves, above all to inspire them with a hunger for the best in both spheres so that these youngsters may reach a synthesis of the two . . . here lies the true responsibility of the educator.

Nor are such goals to be achieved by reliance on strange and recondite means; but by an illumined grasp of what lies at hand. Surely a realization of the kinship of the past and present can demonstrate an equally close relationship between the present and the future. Surely a knowledge of the heritage left by great men in favor of the student himself can point a parallel, the boy creating a heritage himself in favor of others.

Each step in the daily routine is thus made to hold and reveal significance. The very instruments a boy uses in mechanical drawing is such a focal point. Since the human mind works by analogy, since drawing instruments are the tools of great engineers in reaching great achievements, certainly such instruments should reflect their high purpose in their high quality, in the care with which they are selected, in the respect the instructor yields them. Here is a means to tighten the bonds between the student and his destiny—one which no conscientious educator will neglect.

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BULLETIN H-1—"KEEP YOUR LATHE CLEAN"—tells how, why, and with what to clean the vital parts of the lathe. Contains 16 pages, 19 illustrations. Size 6"x9".

BULLETIN H-2—"OILING THE LATHE"—explains where, how, and with what oil to lubricate the lathe. Size 6"x9", 16 pages, 19 illustrations.

BULLETIN H-3—"THE INSTALLATION AND LEVELING OF THE LATHE"—gives instructions for installing and leveling the lathe correctly. Contains 20 pages, 20 illustrations. Size 6"x9".

BULLETIN H-4—"KEEP YOUR LATHE IN TRIM"—gives instructions for making necessary adjustments, checking power supply, and keeping the lathe in best operating condition. Contains 32 pages, 39 illustrations. Size 6"x9".

Used as teaching and study aids, this material will simplify teaching and help you to train better lathe operators. Sample copies of booklets will be mailed without charge on request from any school shop instructor or supervisor.

"SOUTH BEND MACHINE SHOP COURSE"—Widely used by leading schools for instruction in machine shop practice. Thirty-two pages, size 8½"x11". Includes working drawings for projects.

"HOW TO RUN A LATHE"—Complete manual and reference book on the operation and care of the back-geared, screw-cutting lathe. 128 pages 5½"x7⅞", 360 illustrations.

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Gives step-by-step instructions for cutting screw threads in the lathe. Contains 24 pages, 82 illustrations.

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Large simulated blueprints, suitable for framing, show the parts of the lathe, decimal equivalents of fractions up to 1-inch, and 17 "Pointers" on "How To Become A Machinist." Sample copies free on request.

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- ☐ LATHE BULLETINS H-1, H-2, H-3, & H-4
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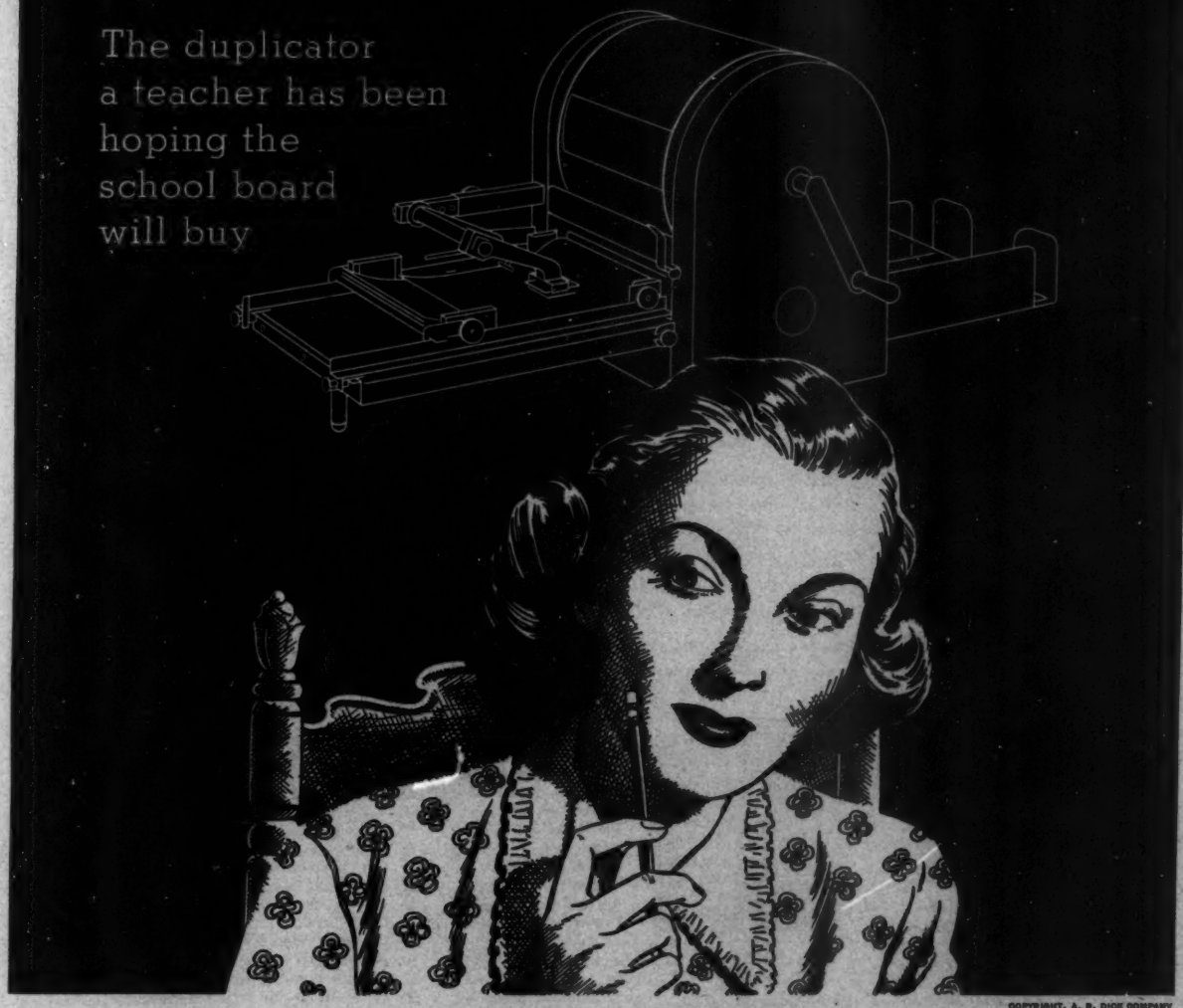

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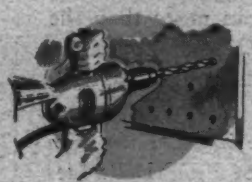

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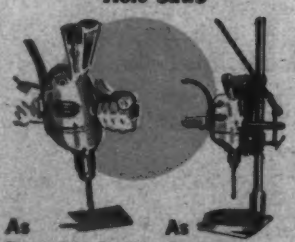
Hole Saws



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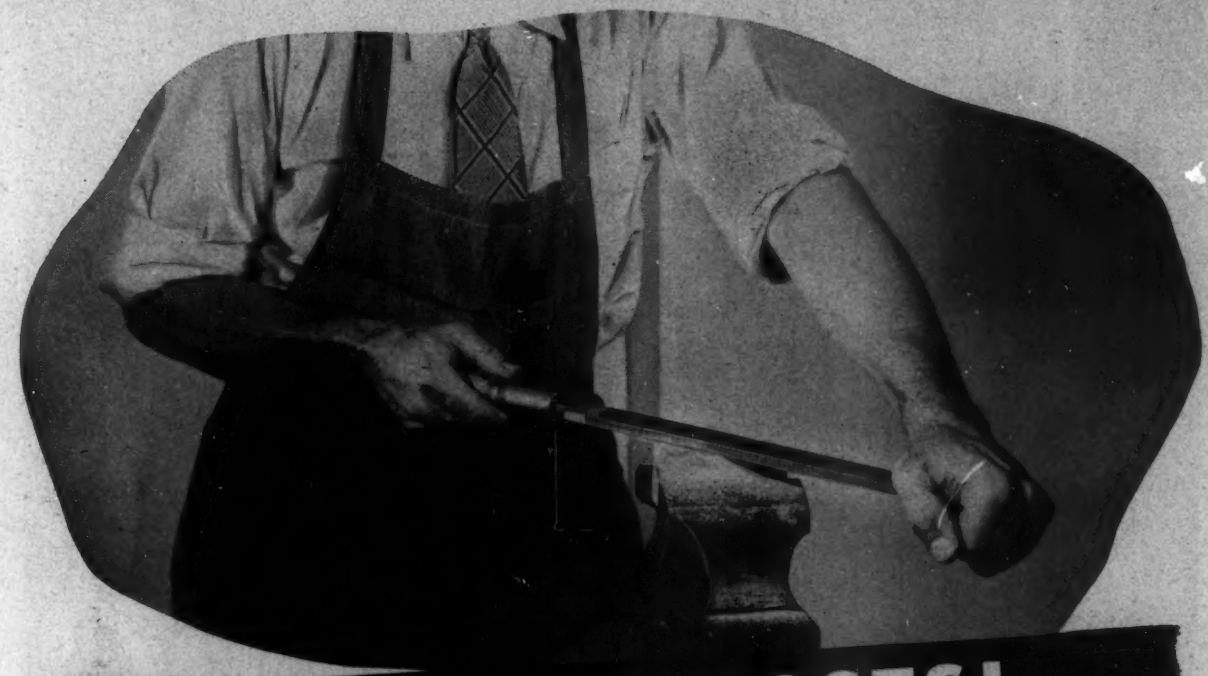

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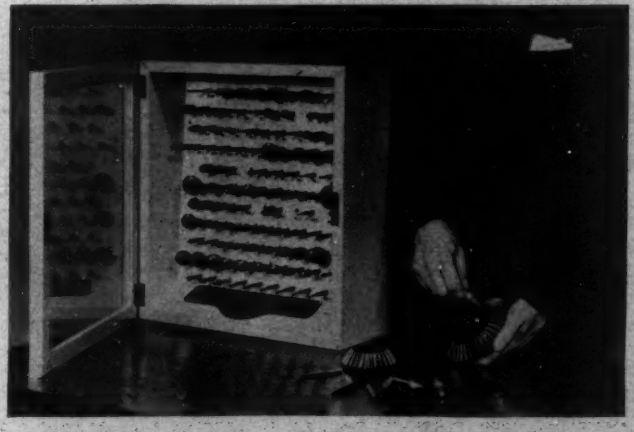

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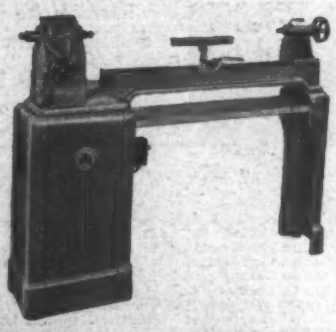

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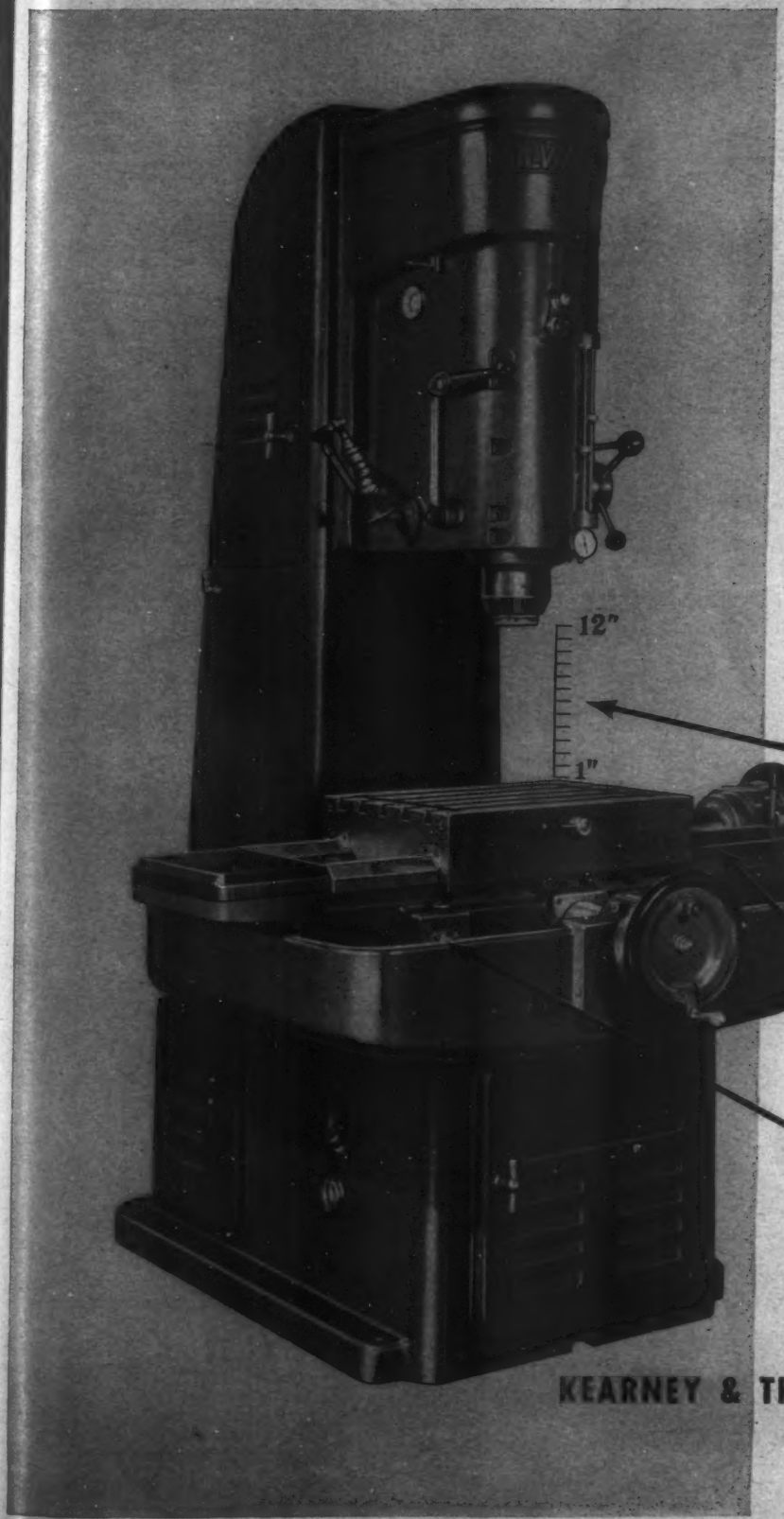

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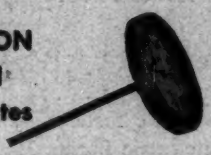

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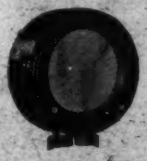

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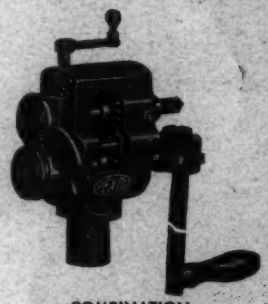
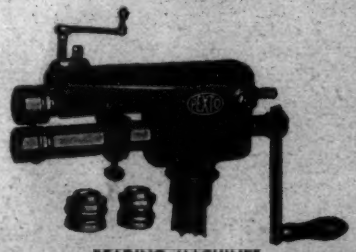


COMBINATION ROTARY MACHINES



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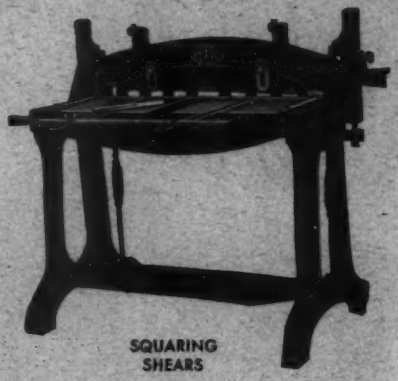

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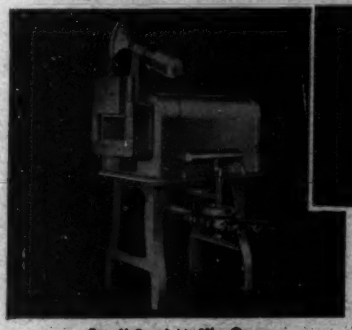

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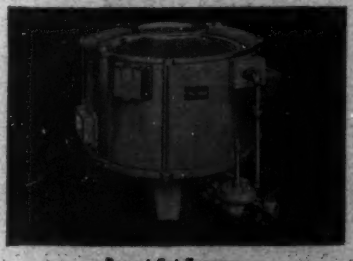

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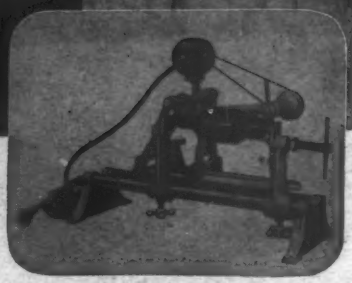

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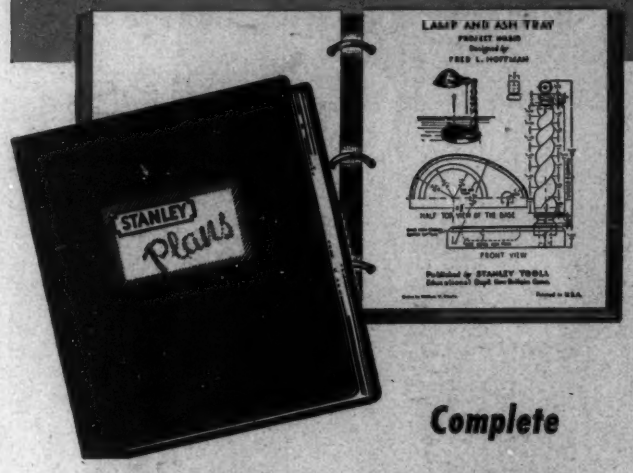

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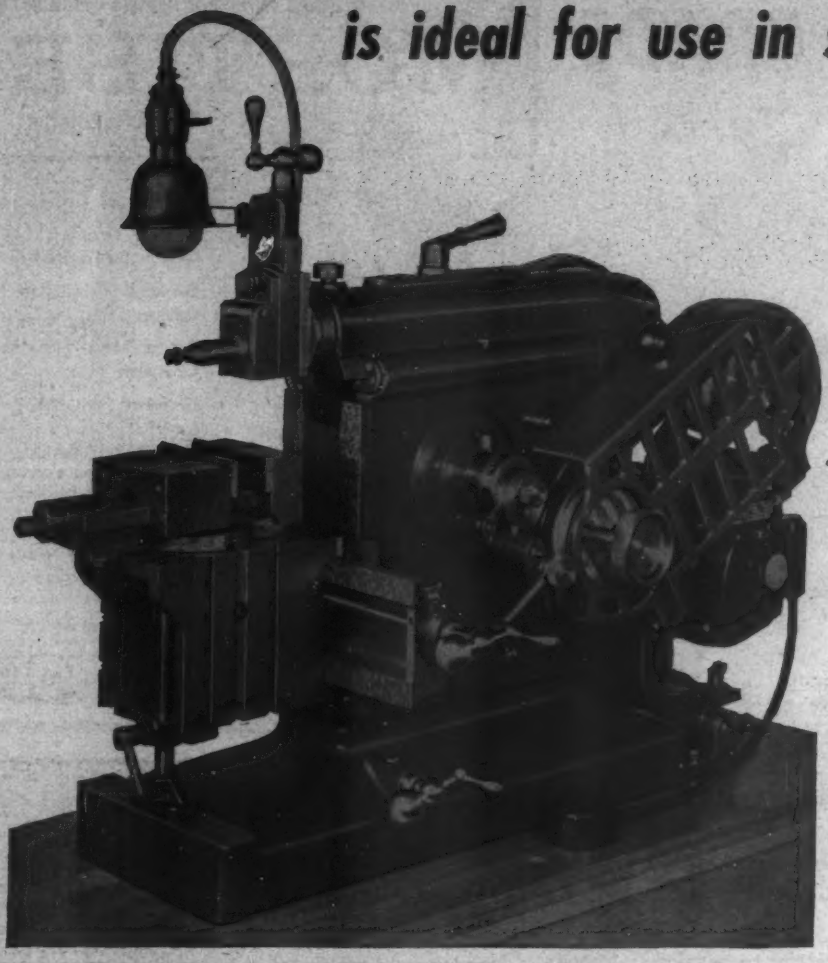

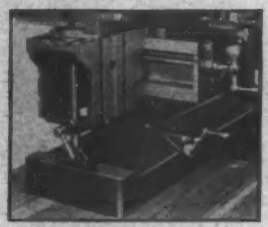

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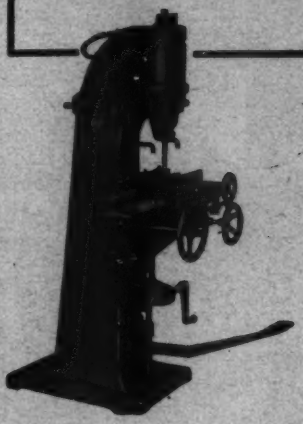

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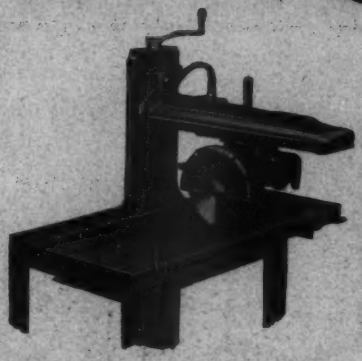

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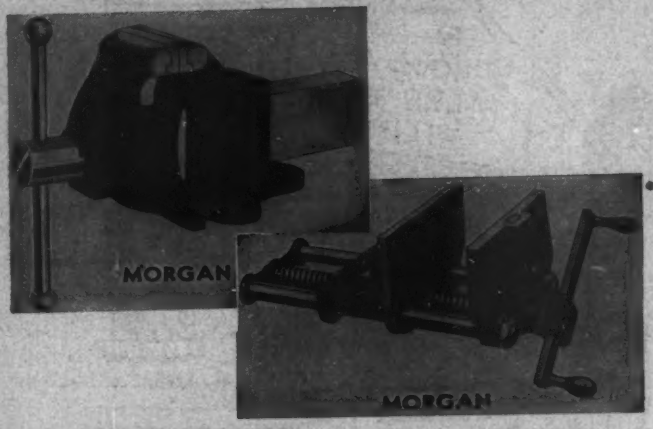

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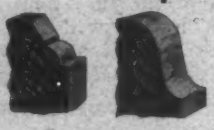

Just three of the innumerable difficult-looking but actually easy-to-make cuts possible with this inexpensive bench shaper and standard cutters.

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Questions

1. Why are Mill files so named?
2. How long (how measured) is an 8-inch file?
3. What are the four general types of file teeth?
4. About how many different files (distinguished by type, cut or size) are there? 250? 1600? 3000?
5. In a double-cut file which is the "overcut" and which the "upcut"?
6. What designations cover the four general degrees of coarseness in the more commonly used files?
7. What are Swiss Pattern files and how, in general characteristics, do they differ from American Pattern files?
8. Special-cut files are generally used on what metals or alloys (name four)?
9. What machinists' files are *not* double-cut?
10. What is a Lead Float? A Riffler?
11. What type files come in flexible as well as rigid form; and how and on what are they generally used?
12. As distinguished by cross-section, name eight common shapes of files.
13. Name six "Do's" or "Don'ts" that will lengthen the life of any file?
14. What are the chief characteristics of a Lathe file?
15. How does a Brass file differ from an ordinary Flat file?

Answers

2+2=4
4+2=5

A check-up on the correctness of answers to the foregoing questions can be made by referring to the following pages of *"File Filosophy."* If you don't have this widely read authority on files and filing, write for as many copies as are reasonably needed for your instructors and library. *FREE.*

1—Page 13.
2—Page 11.
3—Page 12.
4—Page 9 (or see Nicholson monthly advertisements in *The Saturday Evening Post*).
5—Page 10.
6—Page 12.
7—Pages 20 and 21.
8—Pages 33 to 37.
9—Page 15.
10—Pages 24 and 36.
11—Page 22.
12—Pages 14, 16 and 17.
13—Pages 30 and 38.
14—Page 31.
15—Page 36.

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Federal Vocational Education Bill S.619

Every teacher of vocational education will be pleased to hear that President Harry S. Truman signed the federal vocational education bill S.619 which provides additional money for the further development of vocational education in our country. It is unfortunate that the modest appropriation of $500,000 for salaries and other expenses of state supervisors of industrial arts was entirely deleted before the act was finally enacted into law.

This comparatively small amount of money would have done much in helping the individual states provide better supervision of industrial-arts work, and in improving the program in general.

It is a good thing, however, that Bill S.619 has finally been passed, because it shows that at least one phase of practical education has been accorded some recognition for the fine work that industrial arts and vocational education accomplished during the war years when our schools so efficiently aided industry in preparing the workers that provided the things our country and our allies needed to carry the war to a successful close.

It is to be hoped, however, that industrial arts also will receive federal aid at some not too distant time, not for carrying on the work itself, but for improving the supervision which the states alone cannot afford to provide.

The Start of the New School Year

We believe our readers will find the perusal of the following articles quite helpful in shaping their thinking about the job that confronts them: "Needed Emphasis in Industrial Arts," "The Selection of Teacher Timber," "Industrial-Arts Planning Centers," "Personnel Organization for the School Shop," "Inspecting Machine Work in A General Shop," and "Industrial-Arts Aptitude Test."

While the other articles in this issue were all chosen because they were thought to be specially helpful at this time, those mentioned are especially applicable.

This Month's Cover

Our cover picture shows a very compact arrangement of lathes in the machine shop of the Seneca Vocational High School, Buffalo, N. Y.

Placing the lathes back to back saves floor space and provides ample working space for each operator.

Photograph, courtesy of the South Bend Lathe Works, South Bend, Ind.

Industrial Arts and Vocational Education

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Needed Emphasis in Industrial Arts

*Arthur B. Mays**

The effect of war upon education is a study of vital importance to all educators, but particularly to those engaged in the work of industrial education. This is true because war always supplies extraordinary stimulation to industry. Every aspect of industry is intensified, modified in character, and enormously expanded. Old, inefficient practices are quickly eliminated, new production methods are rapidly evolved, and both the weaknesses and strengths of previous training practices are made strikingly evident. The Civil War hastened the establishment of agricultural and mechanical colleges and greatly stimulated the whole field of engineering and technical education. World War I likewise speeded the passage of the Smith-Hughes Law and brought about the establishment of a national scheme of vocational education of secondary grade which had been needed since the Civil War. There is strong evidence for the belief that another long step forward in industrial education is certain to follow the recent great war. Industrial education in both its major divisions of (1) vocational-industrial education and (2) industrial arts, has experienced a phenomenal development during the past thirty years. Each division has mutually benefited from the growth of the other and today both are firmly established in the schools. Millions of citizens who a few years ago were but dimly aware of the importance of industrial education as a vital aspect of public education in an industrial country are now keenly alive to the importance of this part of the education of every young citizen.

Industrial Arts a Phase of General Education

Industrial arts, one of the two major divisions of industrial education, is basically a phase of general education, and both its values and its stated objectives are those of general rather than of specific vocational education. A glance at the objectives listed in the official bulletin of the American Vocational Association, "Improving Instruction in Industrial Arts," reveals the following as the commonly accepted objectives of Industrial Arts:

1. *Interest in Industry.* To develop *in each pupil* an active interest in industrial life and in the methods and problems of production and exchange.

2. *Appreciation and Use.* To develop *in each pupil* the appreciation of good design and workmanship, and the ability to select, care for, and use industrial products wisely.

3. *Self-discipline and Initiative.* To develop *in each pupil* the habits of self-discipline and resourcefulness in meeting practical situations.

4. *Co-operative Attitudes.* To develop *in each pupil* a readiness to assist others and to join happily in group undertakings.

5. *Health and Safety.* To develop *in each pupil* desirable attitudes and practices with respect to health and safety.

6. *Interest in Achievement.* To develop *in each pupil* a feeling of pride in his ability to do useful things and to develop worthy leisure-time interests.

7. *Orderly Performance.* To develop *in each pupil* the habit of an orderly, complete, and efficient performance of any task.

8. *Drawing and Design.* To develop *in each pupil* an understanding of drawings, and the ability to express ideas by means of drawing.

9. *Shop Skills and Knowledge.* To develop *in each pupil* a measure of skill in the use of common tools and machines, and an understanding of the problems involved in common types of construction and repair.

Industrial Arts Represents Industry

Industrial arts is the recognized representative of industry in the school curriculum in the same sense that such subjects as physics, chemistry, and biology represent the world of science in the schools. The curriculum of the modern school increasingly reflects all the significant aspects of modern life, and since industry is one of the most ubiquitous and obtrusive features of modern life it must, of necessity, be adequately represented in the school experiences of children and youth, if those experiences are to enable them to become constructively adjusted to modern life. It is important that the representation shall be an accurate reflection of industry as it exists in the modern world, rather than a reproduction, at the school level, of the handicraft form of industry of the eighteenth century. There is some justification for the craft type of industrial work in the elementary school for purely pedagogical reasons, having to do with certain forms of art expression, the release and directing of creative urges, and the training of eye and hand of young children. In addition, the historic significance of earlier human practices in the production of useful objects which contributed to the development of modern civilization further justifies certain craft activities in the grades. In the high school, however, which deals with youth who are soon to take their places as consumers and producers in the modern world, modern production procedures and modern industrial materials should predominate in the course content of industrial arts. This concept should guide not only the choice of procedures, materials, and projects, but the class organization also should simulate, as far as practicable, the organization of the personnel as practiced in modern industry. The educative, or disciplinary, values of industrial-arts instruction are definitely enhanced by so managing instructional procedures. For example, in some of the best city departments of industrial arts the instructor plays the role of factory department superintendent and the class is organized as a production group with functional foremen, such as production foreman, safety supervisor, toolroom clerk, personnel foreman, maintenance foreman, etc. The instructor gives instruction but deals with the pupil foremen in supervising the several organizational functions of the group. The testimony of those who have persistently maintained such a procedure over a period of years indicates that this feature becomes one of the most valuable educative features of the course.

Obviously, such an organization of the class also enables the pupils to acquire, through their activities, an understanding of the organization and general productive procedures of modern industry. This understanding is enhanced if at least some of the projects undertaken are worked out as group projects using the necessary division of labor characteristic of quantity-production methods. This sort of class organization can, of course, be carried to an unwarranted extreme, but it is presented here as an illustration of a typical attempt to make the work of the industrial-arts department a true representation of modern-production practices.

Industrial Arts and Science

One of the most significant features of modern industry is the increasing extent to which scientific knowledge is applied in production. Hence it is important that the scientific principles involved in the construction methods used in the shop, and the scientific knowledge related to the nature and preparation of materials used

*Professor of Industrial Education, University of Illinois, Urbana, Ill.

shall be understood by the pupils. The educative possibilities of the industrial-arts experiences are greatly diminished when the emphasis is placed merely upon making things rather than giving due emphasis to what is *learned* through the making of useful and beautiful objects. There is a rich background of instructional material having to do with the physical and social sciences involved in all project work in the school shop, and the educative values inherent in grasping this relationship between the mechanical and related informational features of the work should be fully exploited.

Moral Values and Industrial Arts

Furthermore, there are important moral values to be derived from well-taught shop and mechanical-drawing courses. There are few phases of schoolwork where the moral elements latent in the organized activities of pupils can be more easily seen by them, and capitalized by the teacher in the interest of the pupils. These moral elements have to do with habits, attitudes, and ideals which may be developed through the work of the shop and drafting room. The very essence of good shop teaching is the requirement of planning in complete detail every undertaking from design, selection of materials, and operations to be performed, to the completely finished product. This involves developing the habit of analyzing and planning every job undertaken and persisting to the end always, when once a project is begun. The good teacher never permits an exception in this procedure, and he can easily make the pupil conscious of the importance of analyzing, planning, and following through, whenever he undertakes any worthy enterprise.

Again, the development of the ideal of honesty in work is relatively easy in school-shop instruction because the consequences of dishonesty and the necessity of perfect honesty are rendered obvious by the very nature of shopwork. For instance, if a piece of material in a project is to be exactly 10⅞ in. square, it must be exactly square, and precisely 10⅞ in. in both directions or it will not fit, and there is no effective way to conceal an error. If the teacher takes full advantage, in every case, allowing no concessions with reference to such matters, the pupil can easily generalize from his experience with a little help from a teacher whom he respects. This quality of shopwork is especially obvious in group projects where group opinion serves to enforce the necessity of honesty in work. Much depends, of course, upon the moral standards of the shop teacher. A careless teacher with low standards of achievement may encourage dishonesty, but it is clear that the inherent character of the industrial-arts experience offers every opportunity to promote the ideal of honesty in work.

There is also an exceptional opportunity in shop instruction to promote social cooperation and generosity in contributing to the common good. This may easily be made apparent in the organization of the shop class and in the obvious necessity of avoiding practices which interfere with the successful work of fellow pupils. It is particularly easy to see in group projects to which each member of the class contributes his assigned task. Pupils have little difficulty in observing that the failure of anyone to do his part at the right time and in the proper manner will injure the result of the work of all the others, and that all are equally responsible for the outcome of the undertaking. Here, again, the ideals and intelligence of the teacher constitute a major factor in achieving the desirable moral growth which the situation so clearly suggests.

Self-discipline is another outcome which the careful teacher may easily make clear as a desirable result of the shop experience. The very accuracy of the manipulative processes required to accomplish desired results suggest the importance of self-management. This easily becomes apparent not only in tool processes but in mathematical calculations and in the application of technical knowledge involved in the selection and handling of various materials. Impatience, fits of temper, lack of concentrated attention all produce disastrous results almost immediately in construction activities, and pupils have little difficulty in seeing what happens when self-control is not constantly exercised. Once more, the requisite generalization for the development of the ideal rests, in part, upon the alertness and tact of the teacher who must be ever watchful for a suitable opportunity to drive home a moral concept which may be derived from the pupil's experience.

Industrial Arts, Skill, and Technical Knowledge

There is at least one more feature of industrial-arts instruction that is of major importance in modern education, namely, the development of skill and technical knowledge which not only enable the pupil to test his own powers and interests but prepare him to engage successfully, if he so desires, in vocational-industrial education later. The guidance values of industrial arts are greatly limited in range and they are often overemphasized by educators, but they are great in at least two directions, first in deciding whether or not one desires to engage in a mechanical occupation, and second, if so, in what kind of mechanical occupation. This fact suggests the importance of pouring into the shop courses much interesting and accurate occupational information relating to the various mechanical and industrial occupations. Such information can most effectually be provided through factory and construction-job visitation, motion pictures, class talks, and written reports of investigations by the pupils. This phase of shop instruction is one of the features of the best school-shop instruction of the modern school, and is one of the reasons for changing the name of the nonvocational shop instruction from manual, or hand training, to industrial arts.

The use of industrial arts as basic training for later vocational-industrial education is of increasing importance. Boys who have been well taught in the industrial-arts shops and who decide to become skilled mechanics or machine operators in industry have little difficulty in mastering trade skills and often are much better informed concerning the reasons for the procedures followed, and the technical knowledge needed for promotion than are those trained merely by apprentice practices. This value of industrial arts depends upon the standards of achievement maintained by the instructor, his own skill and knowledge and the emphasis he places upon efficient procedures to be followed by his pupils. Increasingly school authorities are asking for teachers who have had some experience in industry in addition to thorough college training in industrial education. Such teachers are usually more likely to maintain high standards of craftsmanship and modern production methods of work.

The objectives, values, and trends mentioned here may be summarized as follows in terms of what should be stressed in the postwar period we are now entering:

Summary

1. There must be more emphasis upon skill, both in manual and machine processes taught. Some extremists in the progressive education movement have discounted the value of skill, and much of the educative and prevocational values of industrial arts has thereby been lost. There must be a return to Dr. Woodward's emphasis upon skill and knowledge of tools.

2. More scientific and technical knowledge must be imparted in connection with the shop instruction. Almost every element in the present industrial situation indicates the necessity for this development.

3. The growing complexity of industrial processes and of economic and vocational life make urgent an increasing stress upon the development of the *habit of analytical, constructive thinking*. This is largely a matter of method of teaching and instructional skill. It involves the whole range of educational techniques concerned with self-discipline, thoroughness, and desire for perfection. Only teachers who themselves possess this habit can successfully aid pupils to develop it.

4. More attention must be given in course offerings to new materials, new procedures, and new applications of the sciences to the daily work of the world. This will mean constant study by shop teachers and frequent contacts with new industries.

5. Shop equipment, arrangement, and organization must be more accurate representation of modern industry. Pupils must be made aware of the similarities of their procedures, tools, machines, and class organization to the procedures of modern factories and industrial practices.

6. Industrial arts must be assigned a larger place in the time schedules of the school. Much more time per week must be devoted to experiences in shop and draw-

ing room than is now provided in most schools.

7. Industrial arts must be made available to hundreds of thousands of children and youth who are now denied the opportunity for such experiences. This will mean (*a*) a vigorous campaign to extend offerings to small schools in villages and rural areas which have no offerings at the present time, and (*b*) greatly enlarged departments in many schools now offering one or two courses.

8. A closer relationship between the offerings of industrial-arts courses and those of vocational-industrial education is needed. This will be to the advantage of both divisions of industrial education.

9. Greater attention should be given to forms of industrial-arts appropriate for the elementary grades as a required feature of the elementary education of every child.

10. Finally, more outstanding boys and young men must be urged to prepare for industrial-arts teaching as a lifework. Few vocations offer a more promising career, and shop teachers should use every legitimate means to recruit for their profession the brightest and best of their pupils. The future of industrial arts depends upon the caliber of those engaged in it professionally, and upon the leadership developed among them.

What then are the implications of the requirements and trends of postwar industrial arts for the education of industrial-arts teachers? First of all there is urgent need for better selection of students who should be educated and trained for teaching industrial arts. The writer has for many years urged industrial education department heads in the better high schools to encourage their brightest and best students to prepare for such teaching, but with little success. Teachers and department heads persist in directing their best students toward engineering on the grounds that they are worthy of better incomes than teachers receive. As a matter of fact when careers are viewed in terms of twenty years or more it is questionable whether engineers on the average fare much better than the better industrial teachers. The advantages of engineering over industrial-arts teachers is still less certain with reference to opportunities for constructive service as between the kind of industrial-education teaching the brightest and best boys will probably do and what they may do in engineering. There is, in any case, urgent need for highly intelligent young men in the field of industrial-arts teaching.

Teacher-Training Programs

Furthermore, the teacher-education programs in this field need strengthening both in the academic or general education requirements, and in the technical requirements. Our teachers need to be broadly educated to enable them to make clear to their pupils both the applications in industrial arts of knowledge acquired in other subjects and the economic and social significance of the areas of shopwork studied. Besides, men are needed who not only are highly skillful in the techniques taught but are fully informed concerning the procedures and trends in modern industry. They must be deeply interested in the area of modern life which they represent in the schools, so much so that they are constant students of industry in all its major aspects. They also must be sufficiently informed in professional education to be able to organize educationally sound programs of courses and to be competent to teach intelligently and skillfully.

Above all, however, young men are needed who have a sound philosophy of life and of education — men who are perfectly clear in their conceptions of the real social, economic, and character-development significance of their teaching, so that they will be aware of the opportunities to capitalize fully on the values inherent in industrial-arts instruction. Rote teaching is particulaly unfortunate in such a subject field — one so rich in educative possibilities. Much good may result from merely planning and making useful things, but the values which intelligence, skill, and adequate knowledge, on the part of the teacher, may obtain from industrial-arts teaching are so great, that poor teaching in this field seems particularly unfortunate. Perhaps the most needed emphasis in the postwar years, in the field of industrial arts, is better teachers who have been more carefully selected, better educated and trained, and who are better paid for their services.

The Selection of Teacher Timber

*Thomas A. Hippaka**

> "A nation which lets incapables teach it while capable men and women only feed and clothe it, or amuse it, is committing intellectual suicide." — *Edward L. Thorndike.*

The selection of teacher timber must be characterized by intelligence and indefatigable care on the part of all who work with the public schools, as well as those who assume the grave responsibility of making teachers out of this timber. Student selection constitutes the first fundamental step in the much needed improvement of the teaching corps in our public schools, for our school system can be no better than its teachers. Very definitely our profession needs youth with special fitness and a predisposition for the work. It needs those who place the motive of service to humanity high upon their list of reasons for seriously contemplating teaching as a lifework.

Intelligent student selection which holds rigidly to acceptable teacher standards, and not cursory recruitment, is the answer to the number one problem in the public schools of America. For too many years our teachers colleges have accepted young people whose intentions may have been most commendable, but who often failed to become the kind of teachers our schools have so sorely needed. Furthermore, we have no right, and certainly it is not good business, to spend public money upon the education of people for an important public service when they are poor risks at the very outset. It is imperative that we do everything within our power to discover teacher timber with the very best of potentialities, and wherever possible to select those with satisfactory teacher traits which are already quite discernible. These selectees need to be people who fully intend to make teaching a permanent profession and not a steppingstone to some other vocation. Besides, our profession richly deserves and must have in it a lucrative share of the so-called human thoroughbreds.

At this point we who are to select this teacher timber might very well take stock of ourselves for a moment. Are we guilty of speaking disparagingly of teaching as a profession? Do we honestly and sincerely believe in teaching as a profession alongside of other professions as described by Herbert Spencer in these words:

> The spirit of the professions as a whole has always remained the same, service to the community in order to augment life. It is obvious that the medical man who removes pain, sets broken bones, cures diseases, and wards off premature death increases the amount of life. The poet, epic, lyric, or dramatic, along with the actor, severally in their respective ways, yield pleasurable feelings, and so increase life. The historian and the man of letters, to some extent by the guidance they furnish but to a larger extent by the interests which their facts and fictions create, raise men's mental state and so increase life. Though we cannot say of the lawyer that he does the like in a direct way, yet by aiding the citizen to resist aggres-

*Professor of Industrial Education, Iowa State College, Ames, Iowa.

sions, he furthers its sustenance and thereby increases life. The multitudinous processes and appliances which the man of science makes possible, as well as the innumerable intellectual interests he arouses and the general illuminations he yields, increase life. The teacher, alike by information given and discipline enforced, enables his pupils more effectually to carry on this or that occupation and obtain better subsistence than they would else do, at the same time that he opens the door to various special gratifications, in both ways increasing life. Once more, those who carry on the plastic arts — the painter, the sculptor, the architect — excite by their products pleasurable perceptions and emotions of the aesthetic class, and thus increase life.

If we do not believe with Herbert Spencer that teaching is just as much a profession as is medicine, law, engineering, and the ministry, then we are not qualified to act as selectors of teacher timber. Naturally we are not true representatives of the profession. Furthermore, if we do not believe in teaching as a profession, the very people whom we wish to interest in our profession will be the first to know this, and they will pass it by.

During a recent conference of educators in the midwest, one hundred teachers and administrators from our secondary schools and teachers colleges were requested to list educational problems in the order of their criticalness. Sixty-eight of these one hundred educational leaders put the selection of teacher timber first. Naturally the seriousness of this problem has been accentuated by the terrific shortage of qualified teachers in our schools.

The Great Need for More Teachers

World War II found teachers, too often master teachers, literally flocking out of the profession. During the two and one-half years immediately following Pearl Harbor, 200,000 teachers left the profession, resulting in the issuance of 50,000 emergency certificates in one single year, 1943–44. Service in the armed forces as well as more lucrative opportunities in industry constituted the chief reasons for their leaving schoolwork. Whenever production in industry is stepped up we face the very serious problem of losing shop teachers. School boards and school administrators are beginning to recognize this fact. There are some healthy indications that communities are now realizing that industry is to be reckoned with as a vital competitor for the services of good shop instructors, and if the schools are to continue having the services of these instructors, salaries, hours, and working conditions must continue to improve. This can be said and needs to be said without in any way detracting from the service point of view in our profession. In the final analysis, we need first to select good teacher timber, and then to improve the conditions as well as the services we render in the profession.

In our own field the writer has recently completed a study which he has entitled "The Effects of World War II on Industrial Education Teacher Personnel in the Public Schools of Iowa." The purpose of the study was fivefold: (1) To ascertain the number of men teaching shopwork prior to the war, 1940–41. (2) To discover how many shop teachers were still teaching in Iowa's schools when the war closed, 1944–45. (3) To calculate the loss in personnel resulting from the war. (4) To find out what subjects other than shopwork were being taught by our men the year prior to the war, 1940–41 as well as in 1944–45 when hostilities ceased. (5) To see how many men were teaching these subjects the year prior to the war as well as during the year in which the war closed.

TABLE 1. Public School Industrial Education Personnel in Iowa

Teachers	*Year 1940–41*	*Year 1944–45*	*Decrease*
Part-time Teachers	588	312	276
Full-time Teachers	177	160	17
Total	765	472	293

From Table 1 we note that in the year 1940–41, a total of 765 men were teaching shop subjects of one kind or another — 177 of them full time and 588 of them part time. In the year 1944–45, the grand total had diminished to 472 of which 160 men were full-time shop teachers and 312 were part-time shop teachers, a loss in personnel of 293 men. Full-time shop teachers had been reduced from 177 to 160.

TABLE 2. Subjects Other than Shopwork Taught by Industrial Education Teachers

Other subjects taught by industrial education teachers	*Number teaching other subjects in 1940–41*	*Number teaching other subjects in 1944–45*	*Increase by 1944–45*	*Decrease by 1944–45*
Agriculture	127	42	..	85
Agriculture, vocational	1	5	4	..
Algebra	43	39	..	4
Animal husbandry	1	4	3	..
Arithmetic	16	4	..	12
Arithmetic, business	6	1	..	5
Art	3	..	..	3
Athletic manager	1	..	..	1
Aviation	..	8	8	..
Band	7	6	..	1
Biology	58	7	..	51
Business science	1	..	..	1
Business training	38	12	..	26
Chemistry	1	2	1	..
Coach, boys	211	110	..	101
Coach, girls	1	..	..	1
Commercial law	6	7	1	..
Conservation	1	..	..	1
Consumer education	1	..	..	1
Crops and soils	2	1	..	1
Dramatics	2	..	..	2
Driver training	1	..	..	1
Economics	38	15	..	23
English	8	5	..	3
Farm management	..	1	1	..
Farm shops	..	3	3	..
Geography	8	3	..	5
Geometry	42	41	..	1
Girls clubs	1	1	0	0
Government	26	13	..	13
Grammar	1	..	..	1
Guidance	6	1	..	5
Health	3	..	..	3
History	86	35	..	51
Industrial sciences	1	..	..	1
Landscaping	1	..	..	1
Latin	3	1	..	2
Law	1	1	0	0
Life training	1	..	..	1
Literature, American	2	1	..	1
Mathematics, general	67	41	..	26
Music	3	1	..	2
Occupations	3	1	..	2
Orientation	2	..	..	2
Psychology	4	..	..	4
Physical education, boys	66	62	..	4
Physical education, girls	..	4	4	..
Physics	52	59	7	..
Physiology	3	..	..	3
Reading, grade 7–8	1	..	..	1
Science, general	128	59	..	69
Science, social	52	20	..	32
Shorthand	1	1	0	0
Spelling	2	..	..	2
Study hall	..	1	1	..
Tennis	..	1	1	..
Typing	9	9	0	0
Vocations	1	..	..	1
Writing	1	..	..	1

Particularly worthy of note in Table 2 are the following items:

1. The number of industrial education teachers teaching agriculture dropped from 127 in 1940–41 to 42 in 1944–45 — a decrease of 85.

2. The number of industrial education teachers teaching algebra dropped from 43 in 1940–41 to 39 in 1944–45 — a decrease of 4.

3. The number of industrial education teachers teaching arithmetic dropped from 16 in 1940–41 to 4 in 1944–45 — a decrease of 12.

4. The number of industrial education teachers teaching biology dropped from 58 in 1940–41 to 7 in 1944–45 — a decrease of 51.

5. The number of industrial education teachers teaching business training dropped from 38 in 1940–41 to 12 in 1944–45 — a decrease of 26.

6. The number of industrial education teachers teaching economics dropped from 38 in 1940–41 to 15 in 1944–45 — a decrease of 23.

7. The number of industrial education teachers coaching boys' athletic teams dropped from 211 in 1940–41 to 110 in 1944–45 — a decrease of 101.

8. The number of industrial education teachers teaching geometry dropped slightly

from 42 in 1940–41 to 41 in 1944–45 — a decrease of only 1.

9. The number of industrial education teachers teaching government dropped from 26 in 1940–41 to 13 in 1944–45 — a decrease of 13.

10. The number of industrial education teachers teaching history dropped from 86 in 1940–41 to 35 in 1944–45 — a decrease of 51.

11. The number of industrial education teachers teaching general mathematics dropped from 67 in 1940–41 to 41 in 1944–45 — a decrease of 26.

12. The number of industrial education teachers teaching physical education for boys dropped from 66 in 1940–41 to 62 in 1944–45 — a decrease of only 4.

13. The number of industrial education teachers teaching physics increased from 52 in 1940–41 to 59 in 1944–45 — an increase of 7.

14. The number of industrial education teachers teaching general science dropped from 128 in 1940–41 to 59 in 1944–45 — a decrease of 69.

15. The number of industrial education teachers teaching social science dropped from 52 in 1940–41 to 20 in 1944–45 — a decrease of 32.

Decreases shown in Table I are naturally reflected in Table 2.

Since two-thirds of our high schools in Iowa have an enrollment of 100 or less, industrial-arts teachers will almost always be asked to teach some other subjects as well. The small high schools will not have enough boys to warrant full-time teachers of industrial arts. As we prepare shop teachers for these smaller schools we need to bear in mind that they will need to prepare in, at least one other field, possibly two. From Table 2 we note that the greatest demand is in coaching, agriculture, physical science, social science, physical education, and mathematics. Without a doubt these demands will continue in the future.

TABLE 3. School Administrators Teaching Industrial Arts

Administrators	*1940–41*	*1944–45*	*Decrease*	*Increase*
Principals	59	24	35	..
Superintendents	152	187	..	35

With a decrease of 193 teachers (Table 1) it meant the closing of approximately that number of shops. However, if it had not been for our school superintendents, that number would have been substantially greater. We lost 35 principals as shop teachers, but the same number of superintendents stepped into the picture and assumed these responsibilities.

Previous to World War II we had not solved the problem of selection even when the teacher shortage was less acute. People who should never have been allowed to enter the profession were being graduated from our colleges and given responsible positions in our schools. Grave as the problem is, we must not only increase the number of teachers, but there must be a decided improvement in quality if our young people are to receive the kind of education which they must have in order to cope successfully with the complexities of this modern world. At the very root of the problem is the intelligent selection of potentially capable teacher timber.

How to Make the Proper Kind of Selection

In the selection of teacher timber we need to approach the task much as a baseball scout when he searches for new recruits. First, he knows very well what a man must have before he can withstand the rigors of baseball and succeed in it. Likewise, we must know what it takes for anyone to succeed in teaching. Secondly, the baseball scout is constantly on the lookout for such potentialities in youth as will materialize into the necessary skills and other attributes so essential in baseball. Similarly, we must recognize potentialities in our youth which will develop into real teacher strengths, knowing full well that young people of high school age cannot possibly possess these characteristics in full fruition, and that to a very considerable extent we must select our teacher timber on the basis of discernible potential power capable of development under the proper tutelage.

Of course, there will be teacher attributes already far enough along in their developmental stage so as to be quite readily identified as such by the person doing the selecting. These the scout will take cognizance of as he looks ahead at least to the time when the selectee begins his training and possibly to the day when he goes on the job as a teacher.

Who are these scouts whose responsibility it will be to select our teacher timber? Chiefly they are the teachers and administrators in our public schools. All of them are alumni of some teacher-education institution. For live, alert alumni to select students for their alma mater is nothing new. This practice needs to be continued and improved by these people who are constantly on the firing line in our schools where this potential talent is to be found. Who is better qualified to select our future teachers than the people who have watched youth grow, and who have played an important part in their development? They know their potentialities the best; they are best qualified to judge; they are the scouts who in the final analysis will send to our teacher-education centers the better human materials from which will come America's teachers of tomorrow.

Let us now direct our attention to the special qualifications required of our industrial-education personnel. What, then, are the essential attributes of a good industrial-education teacher?

In order to answer this all-important question, 125 school superintendents were asked to co-operate in this phase of the study. On the basis of their seasoned judgment, a criterion of twenty items was formulated which is presented here as a possible measuring stick when evaluating the effectiveness of a shop teacher: (1) appropriate use of supplies, (2) workmanlike use of equipment, (3) shop management, (4) personality, (5) teacher-pupil relationships, (6) effective co-operation with administrators, supervisors, and other teachers, (7) teacher-parent relationships, (8) teacher - industry - business relationships, (9) professional growth, (10) teaching methods and devices, (11) philosophy of education, including general as well as industrial, (12) knowledge and technical skill in the subject field, (13) breadth of college training in industrial education, (14) cultural background, (15) experience in industry, (16) program evaluation, (17) program expansion, (18) guidance and mental health mindedness, (19) pupil management and control, and (20) ability to direct extracurricular activities related to industrial education.

Important as these twenty items appear to be to school superintendents, nevertheless, they would constitute a criterion too cumbersome for the busy teacher to use when selecting teacher material. Besides, many of them would not present themselves as teacher potentials in high school youth. Consequently, it was found advisable to further refine this criterion and to reduce it to its bare essentials. With this thought in mind 500 senior high school boys, their mothers and fathers were requested to rank these items in the order of their importance to them. On the basis of these ratings as well as those of the 125 superintendents, the most important items proved to be eleven in number: (1) personality, (2) teacher-pupil relationships, (3) knowledge and technical skill in the subject field, (4) teaching methods and devices, (5) guidance and mental health mindedness, (6) shop management, (7) effective co-operation with administrators, supervisors, and other teachers, (8) pupil management and control, (9) workmanlike use of equipment, (10) teacher-parent relationships, and (11) appropriate use of supplies. Fortunately they represent teacher attributes detectable in high school boys as we observe them at work in our shops.

Before we could begin to identify these important potentials or to recognize any of the desirable teacher traits already discernible in our youth, it was necessary to have a clear concept of the basic attributes possessed by the successful shop teacher. Unless we did so, our selective process was apt to be very ineffective indeed.

In presenting a discussion of these essentials, the writer sincerely hopes that he has not portrayed to the reader some sort of superman, selected on the basis of a criterion impractical and unwieldy to the person using it. Furthermore, he would be the last to create the notion that teaching is a profession where those who are engaged in it cannot pursue a normal life such as is

afforded any reasonable person in any other profession.

Method of Selection

Method is important in the matter of selection. It needs to be made up of practices practical and usable to the busy teacher and school administrator. These techniques must be of such a character that school people may employ them daily as they pursue their duties in the classroom, laboratory, shop, and community. It is with this thought in mind that some suggestive techniques are presented here.

We need to sell the advantages of our profession in contrast to the more or less constant magnifying of its disadvantages, which we have tolerated for too long a period of time. The disagreeableness of our work has been so completely sold that it is about time we presented the pleasant, agreeable, and constructive phases of it. After all, teaching has no first mortgage on the occupational ills of this world. Every occupation has its drawbacks.

As we collect and prepare occupational materials in our guidance work, we must not overlook the field of teaching. Appropriate leaflets should be prepared which are attractive and authentic in every detail. This material should be presented to the pupils just as carefully as that of any other occupation, for teaching deserves equal consideration with other vocations.

Surely the better high school students will not become interested in teaching unless we who are in it exhibit real enthusiasm for the profession. Nothing is more contagious than the genuine enthusiasm of the teacher, and we need to make it felt with the type of young people who would be a credit to the work.

If we are to attract a high caliber of teacher timber into our teacher-education institutions, we must constantly improve these colleges. They must be staffed by men and women who have taught in our public schools and who know their problems. Physical plants must be modern as well as adequate in size, supplied with the latest and best equipment. Out of such institutions whose curriculums are designed to meet the needs of their output will come teachers whose excellence alone will draw others to our ranks.

We must believe thoroughly in the sacredness of our work and show it as we go about our daily tasks.

Every possible source of information relative to our students should be employed as we counsel pupils regarding our profession. Where we have access to the accumulative school records of pupils, such records should be intelligently utilized in our counseling. If they are not available as such, we will need to ferret out such records as may be found scattered about the school. Scholastic records, test scores, work experience, family background, and the extracurricular performance of pupils will need to be taken into consideration. Wherever we find youth at work or at play we should endeavor to be there to observe them and to learn to know them better.

In our shops we are in a most advantageous position to check on the eleven items which make up the criterion suggested earlier in this presentation, and of which personality is the first and foremost. Because of our intimate associations with our boys we are in an advantageous position to check on the matter of personality. If they have any peculiar *twists* we must detect them, for surely there is no place in the teaching profession for a *screw ball*. Clearly defined potentialities which point very definitely toward the development of a well-integrated person should be found in these young people before we encourage them to enter our profession. Above all, they will need physical and mental health, character, intelligence, emotional stability, social adjustability, a deep sense of responsibility, and a religion, if they are to succeed as teachers.

Where teachers encourage maximum pupil participation in shop activities, additional teacher potentialities can be identified. Knowledge and technical skill in the subject field, workmanlike use of equipment, and appropriate use of supplies come to the fore as we observe students at their work. Likewise, there will be manifestations of pupil ability to manage the shop and even to control fellow students where such opportunities are made available. Whenever pupils are allowed to assist other students with the learning process, actual teacher potentialities are bound to exhibit themselves. There is no better method to arouse interest in teaching, and certainly there is no better way to identify teacher potentialities as well as attributes in the making.

Ultimately though indirectly there is no better method whereby thoroughbreds can be influenced to enter teaching than by constant upgrading of the profession itself. Advances in this direction are steadily gaining momentum. Once and for all time, the profession must take the responsibility in this vital matter. High standards must be self-imposed by those in the profession. We must cease to have outside agencies constantly imposing requirements upon us. Any profession which assumes this unique responsibility always enhances its standing in the eyes of the public. Naturally, where such foresight and planning prevail, the returns are generally most worth while, for capable people seldom contemplate entry into a profession which has neither standards nor professional pride.

Attractions in the Teaching Profession

Very definitely there are attractions in the teaching profession. While the importance of the salary in any field of endeavor cannot be denied, we need to evaluate its other attractions as well. Salary is important, but our estimate of a profession must include many other items as well, for we can be very unhappy in our chosen vocation in spite of a satisfactory salary. We need to examine these inducements in the light of living a life as well as earning a living. These evaluations are extremely important, in order that we may make a fair presentation of them to the type of young people whom we would wish to see enter the profession.

There is something sacred about this business of teaching. After all, we are working with human materials, shaping personalities which only God can create. It was Bruce Ryburn Payne, president of the George Peabody College for 25 years, who had this to say about the Godliness of teaching:

> "And surely this is God's work. If the leading of the minds of youth from darkness into light, from shadows into sunshine, from intellectual chaos into orderly thinking, from dullness of perception into systematic enjoyment of beauty — if this is not God's work then where will you go to find it?"

Not only do we work with human beings, but we have them with us in classroom, laboratory, and shop during their most formative years when they are looking ahead, preparing for a future with all the hope, vigor, and enthusiasm which only youth can muster.

When one becomes a teacher, he has the rare privilege to mold human character. No nation is ever stronger than the moral character of its people. A citizenry of character has acquired the internal disciplines which are so essential for right living. When armed with character a nation becomes unconquerable. America in a very large measure remains free because of its teachers, and freedom is constantly a luxury in many parts of this world.

Teaching gives one the rare privilege to be a friend to those who are endeavoring to grow to strong manhood and womanhood. Youth, in spite of reports to the contrary, crave the friendship of adults. We need to remember that we cannot make friends with youth by long distance nor can we do so at sixty miles an hour. In the words of Bruce Ryburn Payne:

> "When a little child looks up into your face with the trustful faith of unspoiled youth and believes that you are to him a friend, you have in that moment possessed yourself of the rarest gift which God-created beings can present to you. It is a holy possession — a gift from the world's greatest Friend."

Ordinarily teachers enjoy a very great amount of freedom in their work. The better schools employ capable people and give them every opportunity to employ their initiative to the best possible advantage. Likewise, the more progressive schools afford teachers every possibility to help formulate school policies and to put them into practice.

Yes, it is true that often we are not appreciated quite as much as we think we should be, and still, we must cheerfully carry on in the face of such a condition. However, this is likewise true of other pro-

fessions. Thus, our missionary zeal, and every great teacher has it, gets a chance to function. While our kindnesses to others are not always recognized, nevertheless, we enjoy the deep and abiding satisfaction which comes from having helped to send someone on his way to success, yes, even to fame.

Teachers who really function are a constant source of encouragement to parents. After all, this business of being a parent is not an easy task. More than we teachers realize, parents lean on us for help. When we have succeeded with the pupil, we have also succeeded with the parent, all of which makes us rather important people in the community. Next to the boy's parents, we as teachers can well become the most important people in the world.

Teaching constitutes a fascinating, worth-while challenge, for it takes the best that we have to offer in the way of planning, thinking, and doing. Not only is it a big business, but it is the most important enterprise in the world. Through education we can make the world what we will, if we are willing to pay the price in money and energy.

Surely there is very little monotony in teaching. Needs, outlooks, programs, and methods are constantly changing. One works with all kinds of people in a variety of situations. There is a crying need for research and even pioneering for the brave and aggressive who are willing to blaze new trails.

We hear a good deal about average teaching salaries being low. It is true that there are those in our profession who remain in it only temporarily, and who thereby lower the average of salaries. On the other hand, if we took the average of the salaries of those of us who make teaching a lifework, we would find that this amount would prove a very respectable one. Not only are our average salaries commensurate with those in other professions, but we must admit that initial salaries of beginners in our profession are relatively high as compared with those for college graduates in other fields of work. Furthermore, our pay is regular and assured. There are very few cities in the United States where teachers do not receive their pay checks regularly each month, which is not true of every profession.

Those who select teaching as a lifework are not entering a failing business. Bruce Ryburn Payne would have us understand:

> "The schools have not failed the people. Whether you regard their past performance or their present achievement they stand out as the largest single successful industry in the world. Quantitatively and qualitatively no progress of the past quarter century is comparable to that of our people's schools."

Public education in the United States costs approximately two and one-half billion dollars a year. We who teach are engaged in a constantly expanding business. While schools do consume considerable wealth, they create much more wealth than they consume.

Then there is the ever present opportunity to champion youth; to fight for the type of environment which our young must enjoy if they are to grow up to be the kind of citizens that a democracy must have in order to survive.

If there had never been any teachers, there would be no craftsmen, doctors, lawyers, statesmen, ministers, nurses, homemakers, agriculturists, or engineers. Practically all of them became skilled in their respective fields because they had teachers who taught them.

When it comes to the matter of teacher supply and demand, we have never had too many good teachers. Consequently, there is always room at the top in our profession for those who would make it a lifework for themselves and a blessing for others.

Lastly, teaching affords us an opportunity to play an important role in shaping world peace. Lasting peace will come when people everywhere have been educated to live in peace with one another. James Hilton would have us know our importance in this area when he says:

> "If I had a child who wanted to be a teacher I would bid him Godspeed as if he were going to war. For indeed the war against prejudice, greed, and ignorance is eternal, and those who dedicate themselves to it give their lives no less because they may live to see some fraction of the battle won. They are the commandos of the peace, if peace is to be more than a short armistice."

The Place of Guidance in Apprenticeship*

*William F. Patterson***

With our nation reconverting to peacetime production and a record number of our youth seeking training or education, educational and vocational guidance counselors are confronted with their greatest challenge.

More than two million young men and women each year face the problems involved in entering wage earning occupations. To this number has been added a vast army of former servicemen and women who never had a job before; also a great many veterans who were attending or planned to go to college but have decided they want to enter industry or go into business. The latter development is especially true of the older veterans and those who married after they entered the service. In addition, we have many who do not want to return to their old jobs.

Because we have today this record number of young people in need of guidance, vocational guidance counselors may be interested in the following figures which show how opportunities in apprenticeship have increased recently.

In 1944 new apprenticeship programs which were approved covered 4500 establishments. In 1945 this figure jumped to 13,600 and judging by expansion of apprenticeship after V-J Day, the figure for establishments participating in apprentice training, in 1946, will be far beyond that of last year and the total number of establishments training apprentices will set a new all-time record.

This shows that industry — its management and labor participating in apprentice training — and government agencies concerned with apprenticeship, are giving our youth seeking careers as craftsmen the greatest opportunity in our history to learn a skilled trade, which means through apprenticeship.

But we would be doing a disservice to our youth and hampering the national economy if we merely bring into apprenticeship as many young people as the training programs can accommodate without regard to future employment opportunities.

We are still in the first period of reconversion, yet the first quarter of 1946 has established an all-time high for the production of civilian goods, according to the office of War Mobilization and Reconversion. But our domestic needs will

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**Director, Apprentice-Training Service, U. S. Department of Labor, Washington, D. C.

not be filled for years to come. Only a small fraction of the automobiles, radios, clothing, and homes that are being eagerly awaited are being produced.

Thus it follows that vocational guidance has the greatest task it ever faced in the work of advising our youths regarding the trade, business, or profession in which they can earn a good livelihood and assure themselves of reasonable financial security.

Adequate guidance must be provided now. Not only are the universities swamped with applications from students desiring to enroll, but the number of young people seeking to learn a skilled trade is larger than at any time in our history. In fact, more young men are seeking apprentice training than can be accommodated. In this connection, it might be well to note that craftsmen are still needed, despite mass production. As this is a machine age, we shall always need machinists, toolmakers, and diemakers who build and maintain the machines. And the many service, transportation, and building trades also need skilled workers.

What are some of the tasks confronting us in guidance in apprenticeship? First, the young man planning to learn a skilled trade should be told exactly what apprenticeship is. That it is the only tried and proved method by which he can become a craftsman who can compete with the other craftsmen now in the trades. That it means employment and learning while working, and studying at a vocational school the theory of his trades and other subjects he will need like mathematics, blueprint reading, and English. The prospective apprentice should be informed of the term of his training, what wages he can expect, how the training program is administered, and what benefits he may derive from a particular trade after he becomes a craftsman.

Guidance workers understand these things — and that apprenticeship is not to be confused with other types of on-the-job training, but as we have an unprecedented number of young men requesting apprenticeship and a record production program ahead, it is essential that emphasis be laid on giving this detailed information.

The hundreds of inquiries received by Apprentice-Training Service show plainly that many do not understand what apprenticeship is. Apprentice-Training Service has been asked, for example, about apprenticeship for salesmen, store managers, and electronics workers. Salesmen and store managers do not come under the category of apprenticeable trades. A skilled electrician may work in electronics, but an engineer or a semiskilled worker also may find employment in the electronics field.

To simplify this information task for vocational guidance, Apprentice-Training Service has compiled a list of some 120 apprenticeable trades, together with the term of training required.

The next, and most important service to be rendered by vocational guidance, is in determining that the prospective apprentice is suited for the trade — mentally, physically, and emotionally — that he will want to complete the term of apprenticeship at the wages specified, and that he will want to work at the trade.

As standards set for craftsmen in industry today are high, the prospective apprentice should be informed he should have a high school education and that to obtain thorough training, he must also be willing to take classroom instruction regularly until he has finished his apprenticeship.

It should not be overlooked that a young man's special aptitude and emotional make-up should be suited to the trade he may want to learn. The skills required and working conditions in the building trades, for example, are quite different from those in watchmaking and tool- and diemaking.

The various trades differ in their physical requirements and, therefore, the physical equipment of the prospective apprentice should be considered. Is he robust and active enough to work at construction on a high building? Can he withstand extremes in temperature, humid or dusty working conditions? Or, is he best suited for work that requires little physical exertion?

A publication of the U.S.E.S. contains information that vocational guidance can use to determine whether a person seeking to learn a trade can do the work — at least without impairing his health or being subjected to needless chances of being injured.

This booklet is the "National Physical Demands Information Series for Apprenticeable Occupations." The booklet contains tables of the physical activities required and working conditions in 105 skilled trades. It also summarizes details of physical activities, working conditions, hazards, if any, and gives a job definition for each trade.

One of the most valuable contributions to guidance in apprenticeship has been trade finding, in which Wisconsin was a leading pioneer. This practical method of testing a young man's aptitude and inclination for a trade has been adopted by most of Wisconsin's larger vocational schools and by many throughout the nation.

By this method, which enables a young man to try his hand at plumbing, patternmaking, printing, and other trades, the instructor together with the vocational school co-ordinator can get a good idea whether the young man or woman is fitted for a particular trade, and advice can be given accordingly.

It may interest the readers to know that trade finding, as conducted in Wisconsin Vocational Schools, was introduced in a number of overseas army camps. The Educational Division of the army for about a year has been giving soldiers in redeployment camps those same opportunities to work at various machines and with various tools that were available to give the men an idea of the trade they might like to learn after they return to civilian life. Apprentice-Training Service supplied the army with apprenticeship standards and pamphlets on apprenticeship for the use in these occupation finding projects.

Many, no doubt, are acquainted with another project valuable in guidance in apprenticeship, the more than sixty occupational work studies that comprise the "My Life Work" series, and cover the principal occupations of the city of Milwaukee. These studies were prepared by the Division of Vocational Teacher Training and Research of the Milwaukee Vocational School. The studies give a comprehensive picture of crafts for the counselor to present to the young man interested in learning a trade.

Among the subtitles are: importance of the occupation, future of the occupation, places of employment, the work processes, apprenticeship, work done by the craftsman, working conditions, and entrance to the occupation.

In all of the old, recognized trades, apprenticeship is listed as the proper system under which the future journeyman enters the trade. An exception is made in this study for automobile service mechanics in regard to apprenticeship. The article on the automotive trades states that the mechanics in this field usually are not trained through apprenticeship. The statement is correct, as it refers to a period of about twenty years ago or more when the studies were made. The automotive service industry lagged behind the other trades in apprenticeship. Most garages and repair shops did no systematic training. Today, however, the number of new apprenticeship programs being set up for automotive service mechanics ranks among the first five for all trades.

Not the least important service vocational guidance can give is specific information on local trade situations — the advantages and limitations locally, employment prospects in the community, together with information on off-season employment, either in the trade or a related trade. This latter information is especially important to future journeymen in the building trades, which have their off seasons.

While it is the function of vocational guidance to help young men and women select the vocation for which they are best fitted and in which they can earn a good livelihood, we have a special need at this time to bring more apprentices into the building trades than in the past. This need has been created by the greatest building program in our national history. The number-one project in construction today is the Veterans' Emergency Housing Program. That, together with other housing, farm, public and industrial construction, plus a huge backlog of maintenance

and repairs, will give jobs for years to come to the largest number of building craftsmen ever employed.

Vocational guidance can do its part in this building program by pointing out employment and business opportunities in the construction field to young men. It can also further our building program if counselors give special attention to determine whether a young man has an aptitude for and an inclination to become a building craftsman.

The thousands of veterans seeking apprenticeship and those who would be best served if they were directed to apprenticeship obviously require counseling different from that given to the younger men who formerly constituted our apprentices.

These veterans are older, more matured and anxious to get into the right occupation as soon as possible. Most of them have more definite ideas about what they want than teen-age youths. Many planning on learning a skilled trade may have a faulty conception of apprenticeship. All these factors should be taken into consideration by veterans' counselors.

The necessity of good counseling cannot be overemphasized. Proper guidance will save veterans and other young people precious time in one of the most important periods of their lives. It will have an important bearing on their future, and may mean the difference between success and failure.

In connection with veterans in apprenticeship it should be remembered that those qualified under the G.I. Bill may receive a subsistence allowance from the government while in training. They should be told that to get the government allowance they must be apprenticed in an establishment that has been certified by the approving agency designated by the governor as qualified and equipped to give apprentice training. Veterans and nonveterans also should be told that they will get adequate apprentice training if an apprenticeship program is approved by and registered with a state or federal agency.

Considering these responsibilities of vocational guidance, and the volume of jobs ahead, we can see that all concerned with vocational counseling have an unprecedented job today and will have for years to come.

If it does its job in apprenticeship well, as I am sure it will, the turnover among apprentices which is now too high will be cut down materially.

By helping cut down the turnover among apprentices, vocational guidance will be saving money for employers and will help speed up our national production program.

By directing qualified young men into apprenticeship which will put them on the road that leads to craftsmanship, vocational guidance will assist them in building careers in industry and thus will also make its contribution to society.

The Industrial-Arts Program and the Secondary School Boy*

*Ralph C. Wenrich***

In order that all readers may have a common understanding of the subject to be discussed, it might be appropriate to consider the meaning of the terms used.

The term industrial arts will be considered in this article as it is defined in Bulletin No. 34, *Industrial Arts, Its Interpretation in American Schools,* prepared by the United States Department of Interior, Office of Education. According to this bulletin, "Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry."

Secondary schools, as used in this discussion, refers to both junior and senior high schools. If the school is organized on the 6-2-4 plan the junior high school would consist of grades 7 and 8 and the senior high school, grades 9 through 12. In other systems, where the 6-3-3 plan is used the junior high school would be made up of grades 7–9 and senior high school, grades 10–12. It will be noticed that the subject to be discussed includes only *boys* in the secondary schools. Girls were not included because industrial arts on the secondary school level is still largely considered to be an activity for boys.

To the question "What are your objectives in industrial arts?" many teachers might tell me that they are attempting to meet the aims of general education as set forth in the seven cardinal principles of secondary education. They might show how their program of industrial arts is making some definite contribution in the accomplishment of each of these principles. One state course of study relates industrial arts to the health principle by stating that this activity should, "develop and establish in the lives of the pupils the method and processes of performing manual activities which are in greatest accord with the conservation of human strength, the gaining of muscular skill and control, and the assurance of safety to life and health." If this can be done for health it is believed that the relationship between the industrial-arts objectives and each of the seven cardinal principles can be shown.

Others would respond to the same question by outlining more specific objectives such as (1) to develop consumer appreciation; (2) to provide tryout or exploratory experiences; (3) to develop handy-man abilities; (4) to develop avocational interests; (5) to vitalize the educational program; and (6) to provide vocational or semivocational training.

The fact is generally accepted that industrial arts serves as a fundamental part of general education for all boys in the secondary school. Without a doubt, a good course in industrial arts can do much to help our young people adjust themselves intelligently to our complex industrial civilization. It tends to develop intelligent consumers as well as producers. And it adds interest and enjoyment to modern living. It trains boys in leisure activities. It gives them an opportunity to explore certain occupational areas.

Industrial arts does all these things which we have claimed for it. But haven't we discussed these objectives until the phrases used to describe them have become hackneyed? We, therefore, are inclined to repeat them without a great deal of meaning. Let us today consider our industrial-arts program in terms of the needs of the individuals for whom the schools exist.

We have heard many lectures and read considerable literature during the past several decades about the child-centered school. This is a worthy movement to which educators have given much lip service. The industrial-arts teacher can make his program a truly child-centered situation if he will only stop to analyze the needs of the boy and then plan his activities to meet these needs. What are the needs of boys which can be met by your industrial-arts program?

In order to analyze adequately the needs of boys we must first consider the society in which they will live. We must recognize the fact that the society in which we live is basically industrial. With the develop-

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**Director, State Board of Control for Vocational Education, Lansing, Mich.

ment of new materials and machines, boys now in school will probably live and work in a world that is even more industrial. This industrial progress tends to raise our standard of living and to give us more leisure so that we can enjoy a fuller and richer life. However, we cannot overlook the fact that this complex industrial society creates a whole gamut of new problems for the individual. Unless young members of society are properly prepared to live in this rapidly changing culture, we may find that science and industry have progressed beyond the ability of people to absorb and integrate its product. The atomic bomb has created social problems which we have not yet solved.

Since "manual training" was introduced into the program of the American public schools in the early eighties, the social-economic character as well as many details of American society have been changed radically because of certain significant inventions and mechanical and electrical improvements. Some of these are the telephone, the phonograph, the tungsten-filament lamp, the electric railroad, the central power station, the motion picture camera and projector, the steam turbine, the high-speed gasoline engine, the linotype and monotype in printing, the Diesel engine motor, the X-ray, high speed tool steel and alloys, the airplane, the vacuum tube, television, and radio broadcasting. The industrial-arts program of tomorrow, therefore, must concern itself with and draw its subject matter from such sources if it is to meet the needs of youth now in school.

The Needs of the Student

The needs of boys must be considered in the light of the technological society in which they will live. It may be well, therefore, to discuss the needs experienced by all boys:

1. *All boys need an opportunity to express themselves through some type of physical activity.* Physical activity provides an all-important means of learning and growth from earliest childhood. At first it is activity for activity's sake. As the nervous system matures, activity becomes more specific and purposeful, developing into an impulse to manipulate, which cannot be inhibited without warping growth. This manipulative impulse manifests itself in a tendency to find much satisfaction in the handling of tools and materials. This impulse grows, if directed, into the urge to construct. Its particular form of expression is determined largely by the conditions of the environment in which the child matures. The school can make a part of this environment whatever it will. If the schools fail to recognize and direct this native impulse, the impulse may find an outlet in some undesirable form.

What subject in the secondary school program is as well suited as industrial arts to provide this much needed activity? Industrial arts introduces a miniature world in which the boy can find a complete cycle of living. Here he has a vehicle for expression, not in words, but in the processes of shaping, constructing, assembling, and disassembling materials. Here the boy should have the opportunity to use a variety of tools and materials in constructive activity.

This need has been recognized for many years. Manual training in the eighties and manual arts in the early part of the twentieth century served this purpose. Some teachers are still teaching in a manual-training or manual-arts shop, where the emphasis is on the development of skill in the use of hand tools to the exclusion of all other learning which might take place, and where all activities are limited to working with wood. An industrial-arts shop in which boys are prepared for the future should include a wide range of subject matter selected from all phases of industry. It should teach tool skills; but in addition, it should serve to develop good methods of procedure and the selection of appropriate designs and types of construction.

This article does not imply that skill in the use of hand tools should receive less emphasis. Unless the efforts of secondary school boys are supervised and stimulated, they are satisfied with very crude results. While serving the purpose of developing understanding to a limited degree, these efforts on the part of pupils lack attention to details of exact form and measurement, to the selection of the most appropriate materials, and to the best type of construction, all of which are essential in a realistic world. Skillful teaching enters here, not to coerce, but gradually to develop an appreciation of refinement in workmanship. The development of such an appreciation at this time is often the first step in the recognition and acceptance of adult standards of workmanship on which modern industrial life is so dependent. Skill should be considered as a relative term, based on the experience of the individual rather than on some definite measurement of adult achievement. When interest and appreciation are made the controlling factors, and the worker achieves satisfaction in his product, the acquisition of skill should develop as a natural consequence.

Interests and Abilities

2. *All boys need the opportunity to explore their interests and discover special abilities.* Individuals have different interests; some boys in our secondary schools have many interests; others have few. But all boys have certain interests upon which the school can capitalize. Interests, if recognized, and dealt with appropriately, can be powerful motivating factors.

Special abilities, like interests, are possessed by boys in a variety of kinds and degrees. Unless provisions are made for activities in which boys can discover and develop their abilities, they may remain dormant throughout life.

Once these interests are explored and abilities discovered, the individual needs assistance in relating them to a future career. The multiplicity of occupations from which a boy may choose makes this a difficult decision. Industrial arts should provide situations in which boys can test their abilities and interests in a wide range of activities resembling actual work.

Too often the content of industrial arts bears little or no relation to the interests of those it serves. It would seem that industrial arts could make a much greater and more lasting contribution if teachers would take into consideration the individual's interests. One industrial-arts teacher in Michigan has each pupil fill out a form at the beginning of the school term on which the student indicates his interests as revealed in outside activities. This information serves as a guide to the instructor in formulating a program for the individual based on existing interests. Is your program sufficiently flexible so that you can consider a boy's individual interests, as well as the interests of the group? During my experience as an industrial-arts teacher a ninth-grade boy reported to the shop resentful of the fact that he was required to take this type of work. He had no apparent interest in any type of shopwork. After talking with him, it was learned that he was learning to play the drums. The suggestion that he make a set of drumsticks struck a responsive cord and resulted in an enthusiastic individual keenly interested in learning the skills involved in wood turning. This led to interests in other phases of the shop course.

Most boys have a high degree of ability in one thing or another. Industrial arts can help individuals discover these special abilities by giving them the opportunity to explore the industrial world. This, however, cannot be accomplished very effectively in a shop which has only one or two activities. Also, it is not enough to discover and develop these abilities; they must then be related to the occupational opportunities in which these special aptitudes can be most effectively utilized. This requires that the industrial-arts teacher include in his course of study information concerning employment opportunities in the community.

3. *All boys need an understanding of industrial materials and processes.* In order to live a full and satisfying life in the industrial society of today and the future, it will be necessary for all boys to have an understanding of materials and processes used by industry. Regardless of the occupational choice a boy makes, he cannot escape the need for an understanding of things industrial. Modern man is surrounded by an ever increasing variety of material things. These include plastics, metals, woods, ceramics, foods, and textiles, in addition to hundreds of variations. The inventory of items found in homes of today is greater than at any previous period of history. Industrial arts, if it is to make a significant contribution, should direct attention to the understanding and mastery of our material environment.

Learning How Men Earn Their Livelihood

The subject matter of industrial arts must be derived from the type of society in which we live. Since our industrial society is built around such a variety of materials and processes a program of industrial arts involving the use of only one or two types of materials can hardly be called industrial arts. To confine one's efforts to a narrow field of materials is out of step with the rapidly expanding field of industrial materials in use at the present time. Furthermore, a good industrial-arts program would include information concerning the qualities and characteristics of materials, their sources, their abundance or scarcity, their relative values, and their past and present contribution to industrial and social activities. An understanding of the basic technical knowledge which lies behind the tools and machine processes is important in our industrial civilization. Boys need to know more about the *why* of industrial materials and processes as opposed to the *how*. For example, do our students know why certain woods are appropriate for certain uses and not for others? Do they know why tool steel is harder than cold rolled steel or do they merely use these materials?

4. *All boys need an appreciation of industrial workers and their tools.* Boys need to acquire a respect for the industrial worker. They need to recognize the fact that a good builder, a good locomotive engineer, a good telephone or automobile repairman is of as much value to society as a preacher, a lawyer, a doctor, or a school teacher. They need to develop an appreciation of the skills of those engaged in industry as it is exhibited in design and construction. They need the opportunity to see and feel industry as a social institution. Even though they may never earn their livelihood through industrial pursuits, they should recognize these values as consumers.

Learning How to Co-operate

5. *All boys need to develop attitudes which will help them to be successful in their relations with associates.* Included in these attitudes would be a willingness to co-operate with others, a consideration for the convenience and welfare of others, a willingness to assume responsibility, and a reasonable reliance on one's own ability. Other personal traits such as perseverance, enthusiasm, adaptability, honesty, loyalty, sincerity, and industry are also important. If boys are to be prepared for successful employment in any occupation, they need to have a wholesome attitude toward work; this and other characteristics may be more important to an employer than a high degree of job proficiency.

If there is any place in the secondary school where personality traits can be developed, it is in the industrial-arts shop. The shop teacher is in an enviable position to help the student develop such qualities as industry, accuracy, reliability, and dependability. In addition to these inherent characteristics of a school shop which lend themselves to this task of developing desirable personal qualities, the teacher can employ special procedures useful in this regard. For example, the participation of pupils in shop management has proved to be an effective device for training in leadership and co-operation. It is not uncommon to find a school shop in which the pupil foreman and assistants take care of the distribution, collection, and care of tools, the maintenance and operation of machines, the conservation of supplies, the records of attendance and achievement, and constant checking and observation to promote safety. The development of such an organization differs from the usual concept of a class; in fact, it becomes a community in which individual responsibility and social interdependence are both essential factors. Also, group projects can be effectively used as a means of accomplishing this objective.

Preserving Mental Health

6. *All boys need a high degree of mental and emotional health.* We have given much attention to the physical well-being of pupils in our schools but have neglected to recognize the need for mental health and emotional stability. The army's experience has brought into sharp focus the importance of this aspect of the individual. Rejections for military service for neuropsychiatric reasons have varied between 7 and 8 per cent of those examined for entrance, and comprise about one third of the rejections for all causes. Disturbed social relationships created in the schools often produce personality maladjustments resulting in psychoneuroses. Dr. Edward A. Strecken in his book, *Fundamentals of Psychiatry*, states, "of the 24,000,000 children in the school systems of the United States more than one million are destined to become so sick mentally that they will require treatment in public mental hospitals." Psychiatrists generally agree that much of the emotional maladjustment manifested in military service could have been avoided by preventative therapy during school years.

Doctors English and Pearson in their book, *Emotional Problems of Living*, make the following statement, "Whenever we encounter a person who is suffering from a psychoneurosis or a psychomatic disease, we ask if he enjoyed school. Practically never do we get an answer in the affirmative." Dr. Gillespie finds that education generally, as presently administered, has no immunizing effect upon the liability to psychoneuroses and allied conditions, since it does not provide what he calls, "pivotal values — values which can justify life and give it coherence." Industrial arts can provide, to some extent, these pivotal values which are so important for mental health and emotional stability.

These are some of the needs of boys, which, in my opinion, have received too little attention on the part of industrial-arts teachers. There undoubtedly are others of equal importance which might be added to the list. It is not implied that those objectives of industrial arts which were listed in the beginning of this article are no longer valid. To be sure, industrial arts can be justified on the basis of the traditional objectives. It should be remembered, however, that there are other needs which are not so generally recognized and which are becoming more urgent in our changing industrial civilization.

The very nature of industrial arts makes it one of the easiest subjects to teach because the learner's emotions as well as his intelligence are in harmony with the learning process. Many teachers, however, fail to see the tremendous possibilities in their subject. Others are not sufficiently well grounded in a broad knowledge of basic science and mechanics to offer the type of industrial arts needed by all boys for a rich and meaningful life in our future industrial society.

It may be well to conclude this article with a summarization of points:

1. Preparation for life in this industrial age demands that industrial arts be more than manual training. A variety of industrial activities in the school shop is indicated.

2. The development of skill in the use of hand tools is still important but this should be considered a means to an end rather than the goal itself.

3. Interest as a motivating factor has not been fully utilized by most shop teachers. Selection of projects should be flexible enough to permit the individual to follow his interests.

4. Industrial arts can make a much more positive contribution in so far as vocational guidance is concerned. Special abilities discovered in the school shop should be interpreted in terms of occupational implications.

5. In the past too much attention has been given to the purely manipulative phases of industrial arts. It is equally important for the boys to know something about the materials with which they are working.

6. Boys need to acquire a respect for workers. The good craftsman is the backbone of our economic society.

7. Desirable habits and attitudes should be developed in the school shop. The teacher must be conscious of this need and plan the program to develop these qualities.

8. The boy in industrial arts is seeking to master himself in relation to his environment. To the extent that the teacher can help the boy find the method of mastery, he is providing a measure of preventative therapy more likely to result in an emotionally stable individual.

Regardless of their future vocations or professions, pupils when they work in school shops meet on common ground. Here they may create material things in accordance with their individual ideas and interests, and in doing so, reveal their own

interpretations and understandings of modern industrial civilization. Here they may explore and experiment; here they may bring their mathematics, science, language, and even history and put them to work; here tangible material results give evidence of technical knowledge and skill. Here is an opportunity to bring skill, knowledge, and attitudes together in the development of character.

Industrial-Arts Planning Centers

*F. C. Tinsterbach**

The planning center is an area set aside, equipped and maintained to function as the location for planning activities in the industrial-arts shop.

The planning activities usually include reading, sketching, enlarging drawing, tracing, writing, making bills of material, checking costs, looking up information, planning sequence of operations, research for new ideas, filing, indexing, pupil personnel management activities, and paper work.

Equipment needs based upon these activities should include, ideally, all of the necessary cabinets, furniture, appliances, and aids which will make possible the carrying out of the various kinds of planning.

Figure 1 shows one such arrangement and includes a bookcase, a magazine storage and display case, a drawing table, a reading table, equipment for enlarging and duplicating, a museum or show case with storage for alternate displays, two bulletin boards — one for progression charts and pupil personnel management data, the other for current interest notices or displays, letter size file drawers, file drawers for 3 by 5-in. index cards, drawers for writing paper, drawing paper, and blueprint storage, drawers for slides and films, a shelf for model display, a rack for rolled charts, a template rack and means for sufficient local lighting to permit close work.

While the sketch shown is designed in the modern manner, many teachers have achieved excellent results with ordinary equipment and a minimum of space simply because the success of the planning is based not alone upon equipment, but upon the attitude of mind regarding *planning* in the school shop.

When the planning center is looked upon as a means for the growth and development of the pupil, a place where he can gain skill in the use of reference material, where he can acquire a knowledge and appreciation for research and investigation techniques, and where his self-reliance, initiative, and creative ability can be allowed to develop to the highest possible degree, then we have a planning center, though the equipment be no more than an old filing case, a table, and a few chairs.

To develop a planning center which will function in the life of the pupil of industrial arts is not an easy task. In the first place the pupil resists anything which he thinks will interfere with his manipulative work. Second, the average teacher is unprepared in planning and research techniques and is hesitant to push something about which he feels insecure. The third element which militates against the establishment of the planning center is lack of space and equipment.

The following suggestions are intended to overcome some of the difficulties mentioned. Of these, pupil attitude is important enough to merit first consideration. It seems that the liberty and freedom inherent in industrial arts is somewhat misconstrued by pupils. As a result, they often attempt to establish policies and procedures which are not theirs to make. While they would not think of questioning instructional procedure in the formal atmosphere of the academic classroom, somehow when they get into the shop environment, caution ceases and immature judgments, likes and dislikes are often aired.

Whenever new work, especially that which concerns writing or reading, is introduced in a pupil dominated situation like this, often the only way out is to establish once and for all the dictum that in so far as instruction and teaching are concerned, the instructor and the course of study shall establish and maintain the policies. After a term or two, the new work becomes traditionally established and little or no opposition is encountered.

This is especially so when the planning work is definitely directed along well-thought-out lines. Pupils do not instinctively know how to plan work; they must be taught. They must be assisted by forms, definite patterns of procedure, and reference material which they can find, and which can be made to function quickly and effectively. This calls for good organizational work on the part of the teacher, adequate reference material, and workable equipment.

The first of these organizational aids, and one which can be made to function in planning even without a planning center, is a *plan sheet* or plan folder. The essential parts of it are pupil and class identity, dates, a bill of materials, space for listing operations and for making sketches. These forms may be printed, mimeographed, or dittoed. They may be simple or elaborate, but should be scaled to the ability of the students to be used effectively. Above all, they should be functional and useful to the student when he carries out the details of his planned work. It is quite essential that the students be guided and taught how to use the plan sheet. A dummy or pilot sheet should be

*Instructor, General Shop, State Teachers College, Buffalo, N. Y.

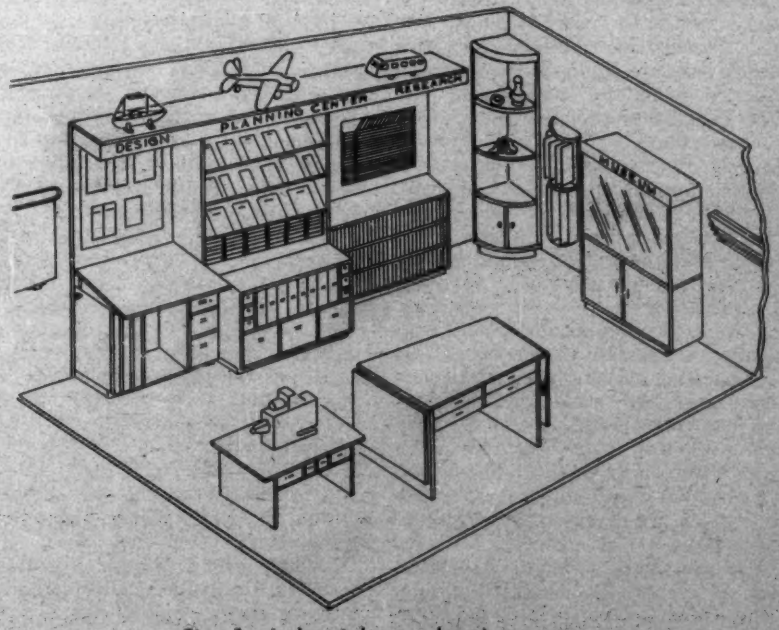


Fig. 1. Industrial-arts planning center

used in explanation and all students should be expected to make sample entries in the form so as to learn the correct procedure.

In order to make effective use of the plan sheet certain equipment and devices are necessary. For choosing the project in the first place, a file of blueprints, photographs, magazines or books, should be available. In order to preserve these and assure their return in good order, an efficient filing system becomes necessary.

One of the most effective is a project file by colors, where all projects related to one certain activity are separately mounted in folders of a particular color. This provides a coarse classification. Further breakdown may be made by key letters or label titles and numbers in sequence. Colored kraft paper, 12 by 18-in. in size, with the project ideas stapled or pasted inside makes inexpensive and suitable folders for this type of filing.

A 3 by 5-in. card index covering projects by name will cross-index the folders and make their location quickly available. A mechanical list finder such as used for telephone numbers is also useful for this purpose.

Supplementary projects in magazines and books must be located by means of card indices and can be cross-filed under type of activity and name of project. Magazines should be filed by years, and should, if possible, be housed in containers which provide for one year's issues.

Manufacturers' catalogs often contain project suggestions, usually a small picture, which if enlarged or altered, forms a basis for drawing or sketching. For this type of work, enlarging devices are needed, such as the pantograph, reflectoscope, or a drawing board constructed for quickly ruling square spaces. The catalogs themselves are usually filed under name of company and cross-filed under type of product or equipment furnished.

Both magazines and books may be made available for loan. In this event a record system (library card, or similar device) should be used. Those books or magazines which may be taken from the shop should be distinctly labeled or else placed in a separate location.

Drawers, shelves, partitions, boxes, and containers of all kinds in the planning center should be clearly labeled and material which is located in these places identified to correspond. Time spent in doing this will be repaid manifold.

General reading matter only remotely related to industrial arts should be carefully selected for it is in the idle perusal of this material that much time is ineffectively spent in the planning center. This applies particularly to the so-called "popular" magazines which, while they are nominally mechanical or scientific, contain so much material of a novel or sensational type, that they can use up a disproportionate amount of time.

The third, or equipment, phase of the planning center can be started with a table and four to six chairs. Bookcases, filing cabinets, and drawing table can be added as time goes on. Once the unit has been started, needs arise which dictate the sort of equipment that is needed. The making of such equipment can well be made a part of the activity of an afterschool group composed of representatives of each class, or as part of the regular work of an advanced class. An entire project of this kind might provide just the kind of challenge that a high school class might enjoy. It is doubtful whether any other kind of activity could be more beneficial to the boy than the lasting contribution made by this kind of enterprise.

A detailed list of equipment and probable use in the planning center follows:

Equipment

Item	*Utilization*
Table	With drawers, for reading, writing, and conference work.
Magazine rack	Slanted shelves for display, compartments for storage, boxes for flimsy magazines.
Bookcases	Open shelves with books readily accessible. Separate compartment for loan copies.
Chairs and stools	Straight back for table, stools for drawing bench.
Drawing table	Adjustable top, compartments for extra boards, drawers for tools and supplies. T square and large triangle to facilitate ruling long cross lines.
File drawers	For 3 by 5-in. index cards.
Blueprint file	Letter size file drawers; flat drawers in table may also be used.
Visual aids table	Table with drawers for slides, film slides, enlarging devices.
Drawers	Letter file size or open shelves for trade catalogs. Smaller drawers for price lists and flimsy material.
Museum	Front opening, glass doors locally lighted, with storage space below for alternate displays.
Bulletin boards	May be made of ⅜ masonite insulating board for current material, progress charts, pupil personnel assignments, etc.
Chart rack	Similar to map racks used in geography for large charts which may be rolled.
Template rack	Storage for templates and similar planning or production devices.
Display shelf	For display of typical models. It is best to have models made undersize or to a smaller scale, to encourage problem solving rather than copying the exact dimensions. Smaller models also minimize the storage problems.
Lighting	Should be localized for display purposes and adequate for close work such as drawing and reading.
Enlarging devices	Reflectoscope, pantograph, inch-square marking frame, squared paper, tab board.
Duplicating devices	If possible, ditto or mimeograph machine, sun frame, or lighting device for blueprint exposure.

Planning Devices

Plan sheet or folder — individual student work sheet — color system — for filing blueprints and project ideas in colored folders.

Item	*Utilization*
Covers	Library type covers for current magazines to withstand wear and tear. Craft paper slip covers for books.
Labels	1. Thin wood labels coated with shellac will take India ink lettering which can be covered with second coat of shellac. These labels can be tacked to shelves and containers and are easily removed. 2. Dennison type gummed labels are suitable for labeling books and magazines.
Indexing	Follow Carnegie library system — see school or public library or devise a local filing plan. Cross-index whenever possible.
Loan cards	Similar to library cards for recording loans of reference material.
Information sheets	Some teachers include a number of related topics to be studied and reported upon in connection with each project. This may be made a part of home preparation or be done in the planning center. Time is saved if such topics are pasted on cards of bound-in folders and filed as such.
Instruction or procedure sheets	The nature of these should be problem solving, rather than step-by-step outlines. They should stimulate thinking on the part of the students. These may be in card or folder form and filed under type of work or by the major process involved.
Assignments and records	Involve human nature. Assignments must be clear, exact, and emphatic, and each assignment must be checked either by report, written answers, recitation or record data. Unless checking is done, it is useless to give assignments.

References

1. Cornell University. Mimeographed bulletin prepared under direction of George Decker, Course A242B. Contains formal aims and objectives for planning centers and detailed outlines for plan of operation.

2. Industrial Arts and Vocational Education. Lists reference material sent free to shop teachers, namely, "Teaching Materials for Industrial Education." Chris H. Groneman.

3. National Industrial Information Committee, 14 West 49th St., New York 20, N. Y. Has prepared a bibliography of

economic and social study materials most of which is in booklet form. Free to schools.

4. U. S. Office of Education, Washington, D. C. Has bibliographical lists of valuable reference material for schools.

5. Mail order catalogs, catalogs from manufacturers, and advertising releases have value.

6. Film library. State Visual Aids Bureau.

7. Book lists. See lists in industrial-arts syllabi published by New York State Education Department.

8. Project folders. Folders of material prepared by former students, if placed in uniform size covers, form a valuable addition to the library.

Personnel Organization for the School Shop

*Lonnie Gilliland**

After several years of experimentation with different personnel organizations, the program here described has been found to be very effective in the cabinet shop of the Capitol Hill Senior High School in Oklahoma City. With a few changes this program can be adapted to almost any kind of a shop program.

Advantages of a Personnel Organization

It has been found to be a very effective means of doing the following things:

1. It teaches responsibility to the student.
2. It develops initiative.
3. It affords opportunities for self-expression.
4. It gives practical training to the student that is not given elsewhere in the curriculum.
5. It serves as a definite aid to the instructor in keeping a check on the many different things, such as, equipment, materials, and supplies, and thus, allows more time for instruction and supervision of the students.

Correlation With Other Subjects

By a correlation with other subject fields, it is possible to make this system very profitable to the student by arousing interest in related subjects, which he may not have valued properly heretofore; and at the same time make a direct application of the subject matter taught in these related subject fields. This is an excellent way of advertising a shop program, because we as shop teachers in too many instances have isolated ourselves from the rest of the curriculum. Since in most schools shop courses are elective, we must make our bid for the better type students if we are to attain a worth-while objective. In our situation, the English department has been most co-operative in assisting with the installing of this organization. Students made applications for the different places of responsibility to an executive committee. The English teachers taught them how to write an application correctly and allowed them a grade in their respective English class for so doing. Previous to this time, most of the English teachers knew nothing about what we did in the shop, but as a result all of them have become very interested.

Preliminary Steps for Installing the Organization

First, the principal and/or superintendent should be consulted and your ideas explained to him, thus selling him on the program which in most cases will not be difficult to do. Second, the head or heads of the department with which correlation is to be established should be consulted with the administration's approval. It is possible that the department head will want you to meet with the departmental group for a discussion of the plan. A positive approach should be made definitely stating how this department can assist the student. It is also possible for the shop instructor to do a little plugging for his department, thereby acquainting the group with what you expect of students in your program. Invite them to make a tour of the shop while classes are in session. Let students serve as guides for them in order to let the student know that the teacher is interested in their work.

Composition and Functions of the Organization

A. *Electing an Executive Committee*

After all of the groundwork has been laid, the program may be started. An executive committee is elected, one member from each class. If an even number of classes is taught, elect one member at large. The duties of this committee are as follows:

1. To receive applications from all the other members of his respective class for one of the following jobs:

a) Shop superintendent
b) Assistant shop superintendent
c) Recording clerk
d) Safety foreman
e) Finishing room foreman
f) Lumber room foreman
g) Tool clerk

Each student is required to furnish at least three references. The English teachers will assist the students in preparing their applications.

2. Check all of the references given by the applicant.[1]

3. Consider all applications, review the references of each applicant, and elect the one considered to be the most capable for each job.

The executive committee meets as a group for all matters of business concerning the program, every day at the beginning of the semester until each job in each class has been filled. Then, meetings are held at least twice each month. Our group finds it more convenient to meet before school, others may find after school the better time. All meetings are conducted outside of regular school hours.

Some may argue that it is impossible to get students to do this, but we find without exception that our students respond 100 per cent. Other arguments may be that this kind of a setup requires too long a period of time for getting into actual operation. After all, our job is that of producing students who can "when they take their feet out from under Dad and Mom's table" earn a livelihood for themselves. This is a very effective way of helping to do the job.

B. *Responsibilities of the Groups Selected by the Executive Committee*

The respective groups meet at a specified time with the instructor[2] for the purpose of defining the responsibilities, duties, and methods for putting each into practice. Each of these groups continues to meet from time to time for discussing problems that have arisen, and to work out a solution to the problems. These meetings are subject to the call of the chairman of each respective group. At the end of each semester, each group of shop superintendents, assistant shop superintendents, safety foremen, etc., turn to their respective class representative on the executive committee a report of the responsibilities and weaknesses of his job along with suggestions for improvement. This is a very valuable source of information for the next group.

Tenure

Each individual is eligible for the same job for one semester and cannot succeed himself.

Compensation

Each student is given a flat number of grade points[3] (his salary) for his efforts and contribution. Each job is rated and grade points allowed according to the im-

*Capitol Hill Senior High School, Oklahoma City, Okla.

[1]Use a printed form similar to ones used in industry.
[2]The instructor acts in an advisory capacity, not dictatorial.
[3]Depending on grading system used.

portance of the job. As long as the student performs in his capacity to the best of his ability he retains the maximum and they are included in his class grades at the end of the grading period. This plan requires a great deal of extra time and effort on the part of the students, and each should be compensated according to his performance.

Conclusion

This type of personnel organization affords an excellent means for planning with other teachers (correlation of subjects), pupil-teacher planning, and pupil-pupil planning, all of which is very essential in the building of a democratic intelligent citizenry.

Aeronautics

*William E. Nagel**

(Continued from page 253 of the June, 1946, issue)

UNIT II

A Three Dimensional World

1. Three dimensions defined.
   a) Length of an idea is taken from history.
   b) The breadth of an idea is derived from geography.
   c) Height of an idea is derived from aviation.
2. List of words or phrases or names to be studied.
   1. great circle
   2. nautical mile
   3. meridian
   4. local meridian
   5. equator
   6. latitude
   7. longitude
   8. parallel of latitude
   9. equinox position
   10. solstice position
   11. Mercator projection
   12. rhumb line
   13. Lambert projection
   14. polyconic projection
   15. gnomonic projection
   16. stereographic projection
   17. orthographic projection
   18. azimuth
   19. Molleweide's homolographic projection
   20. Goode's interrupted homolographic projection
   21. Homer
   22. Herodutus
   23. Eratosthenes
   24. Ptolemy
   25. Behaim
   26. Langley, Samuel
   27. Curtiss
   28. Wright, Orville
   29. Wright, Wilbur
   30. Bleriot

I. The study of the earth as a sphere
   A. The mathematical aspects
   B. The planetary aspects
   C. The geographical aspects

A. The mathematical aspects
   1. The earth's dimensions
      a) Approximately 8000 miles in diameter
      b) Approximately 25,000 miles in circumference
      c) Is not a perfect sphere but is 26 miles less in diameter at the poles
   2. A *great circle* is the greatest possible circle made on the surface of the globe by passing a plane through the center of the globe.
   3. The circumference of the globe is 360 deg. Each degree has 60 minutes (′), and each minute has 60 seconds (″).
   4. A *nautical mile* is the length of one minute of arc measured on a great circle.
      a) The length of one degree equals 60 nautical miles.
      b) $360° \times 60 = 21{,}600$ miles in circumference, which makes the nautical mile larger than a statute mile (800.2 ft. longer). A nautical mile = 6080.2 ft.

B. The planetary aspects
   1. *The sphere* becomes a globe when mounted at an angle of 23½ deg. from the vertical. It now has a definite direction in space and a north and a south pole.
   2. *Meridian:* When planes are passed through the globe so that they will intersect along the vertical axis, their intersection with the surface of the globe form great circles, which pass through the poles. This intersection with the surface is called a meridian.
      a) The word comes from the Latin *meridies* — meaning midday — the highest point the sun reaches in a true north-south direction.
      b) Every place or point on the surface of the globe can have a *local meridian* by passing a plane through that point and the vertical axis.
   3. *Equator* — by bisecting all the meridians and connecting all the bisecting points the line will divide the globe into two equal hemispheres and is therefore called "equator."
   4. *Latitude* — the distance in degrees from the equator to a point on the surface of the globe is the latitude of that point.
      a) For convenience only 10°, 20°, 30°, — 90° are marked on the globe. All the others are present but are not marked.
      b) *Parallel of latitude* — by connecting all of the points of the same latitude a circle is formed which runs parallel to the equator and is called a parallel of latitude.
   5. *Longitude* — the distance (measured in degrees) of any point from the Greenwich meridian measured along the equator *or* any parallel of latitude is the longitude of that point.
      a) Greenwich observatory near London, England, is 0 meridian by mutual consent of all countries.
   6. Time relationships by use of the globe.
      a) The earth rotates once about its axis every 24 hours — or 360° every 24 hours. One hour is $\frac{360°}{24}$ or 15° of latitude.
      (1) Convert degrees into hours and minutes as:
      110° = how many hours and minutes?
      $\frac{110}{15} = 7\ 5/15$. 60′ in an hour.
      Hence, 5/15 of an hour = $60 \times 5/15 = 20$ min. Therefore, 110° = 7 hr. 20 min.
      (2) Convert hours and minutes into degrees as:
      4 hr. 23 min. = how many degrees and minutes?
      4 hr. 23 min. $= 4\frac{23}{60}$ hr.
      $4\frac{23}{60} \times 15° = 65¾°$ or 65° 45′
   7. Tilt of the earth's axis
      a) No tilt would cause:
      (1) Equally long days and nights
      (2) No seasons
      (3) A difference in the distribution of winds, temperature, and atmospheric pressure
      b) *Tilting* and *rotation* cause the difference in the length of days and nights.
      c) *Tilting* and *revolution* cause differences of seasons.
      (1) Equinox position, March 21–September 22. See A, Figure 1.
      (2) Solstice position, June 21–December 21. See B, Figure 1.

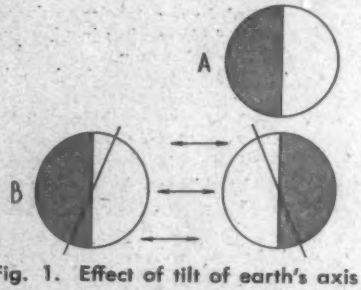


Fig. 1. Effect of tilt of earth's axis

Use a flashlight, a slotted piece of cardboard, and a globe to demonstrate these principles.

C. The geographical aspects
   1. The world before 1492 was thought of as a flat disk surrounded by the Ocean River, with Greece as the center of the world (900 B.C.). Only the fringes of

*Washington Community High School, Washington, Ill.

land along the Mediterranean Sea were known. As more land and oceans were discovered, the concept of a flat surface still prevailed.

2. The world from 1492 till 1903
   a) With Columbus' discovery that the earth was round, the entire thinking of the world concerning geography had to be reshaped.
      (1) Columbus got his idea from Toscanelli in 1474 who got his from the philosophies of Roger Bacon, Aristotle, Anaximander, and certain Moslem geographers long dead.
   b) Shortly after 1492 a man named Behaim made the first spherical earth, but his ideas were discarded.
   c) Mercator maps were then tried so that the old conventional ideas could be projected on a flat surface. The idea was immediately popular.
   d) In 1861 the steel power-driven ship caused speed to become a prime factor in geography.
      (1) The colonies which England, France, Spain, Portugal, and Holland had acquired as bases for old sailing ships became outmoded.
   e) Sea power was the basis for geographers considering the world as a three ocean basin (Goode).
      (1) Control of the main great circle trade routes and the 12 natural gateways to these routes made those nations powerful. As long as England (9), Holland (2), and the United States (1) remained peaceful and were the controlling forces, there was no war.
3. The world today
   a) In 1903 the airplane made its advent. The Wright brothers made the first sustained heavier-than-air flight.
   b) In July, 1909, Bleriot made the first flight from France to England.
      (1) The airplane had given us the third dimension and had made these strategic oceanic gateways obsolete.
      (2) The airplane has created a monosphere on a new pattern instead of the old eastern and western hemispheres.
4. The future of commerce and civilization in a three dimensional world
   a) Cannot limit trade or confine national defense activities to the western hemisphere after looking over a (north) Polar map.
   b) Arctic Ocean is destined to be a world mediterranean sea.
   c) Some thought-provoking statements.
      (1) Three bombers leaving North Cape, Norway, will arrive at Washington, D. C., Des Moines, Iowa, and Seattle, Wash., at the same time.
      (2) Charleston, S. C., and Seattle, Wash., are almost equidistant from Moscow, Russia.
      (3) Minneapolis, Minn., is closer to every capital of Europe than it is to Buenos Aires, Argentina.
      (4) Washington, D. C., is closer to Moscow, Russia, than to Rio de Janiero, Brazil.
      (5) How outmoded Hawaii and Bermuda are when the air route from Germany is through England, Greenland, Nova Scotia, and from Japan through the Aleutians, and Kodiak?

II. Map making, past and present

A. History of early map makers
   1. Homer, a Greek scholar and philosopher, in 900 B.C., thought of a flat world like a disk surrounded by the Ocean River. Greece was the center of the world.
   2. Babylonian maps on clay tablets for the same period show Babylonia as the center of the world, but the same flat disk principle was used.
   3. By the time of Herodotus (400 B.C., Father of History — Greek historian) a little better map was made, but it still had the world as a disk.
   4. By the time of Eratosthenes (200 B.C., Greek geometer and astronomer) it was known that the Strait of Gibraltar, but not the Strait of Kerch, could get one into the Ocean River. Also part of the Atlantic shores of Europe and Africa were known. A few Atlantic Islands had been located also.
   5. Ptolemy's (Greek-Egyptian geometer, astronomer, and geographer) map (A.D. 160) adds a small Indian Sea and a large part of Asia.
   6. During the *Dark Ages* civilization went back and in A.D. 1307, a map looked like the one Eratosthenes made in 200 B.C.
   7. Columbus in 1492 proved his philosophy of a spherical world by discovering the Americas.
   8. Shortly after 1492 Martin Behaim, a German geographer, made the first spherical globe.

B. With the realization that the earth was a sphere, man had to invent methods of changing the maps from a sphere to a flat surface. The following projections resulted:
   1. Cylindrical projections — the poles cannot be shown at all, and the high latitudes are badly distorted.
      a) Mercator projection — (the designer was Gerhard Kramer, a Flemish cartographer, who published a map in 1569 under the pen name *Mercator*, the Latin meaning of which is *trader* or *merchant*, has equally spaced parallels at increasing distances from the equator toward the poles so that the relation between a degree of latitude and a degree of longitude corresponds to the relation existing at the same point on the earth's surface.
         (1) Rhumb line — a course line which intersects all meridians at the same angle, namely, the course angle. The Mercator projection is based upon this fact.
         (2) Cannot be used for nautical maps — only for world maps due to the high distortion of the shape of the continents which makes it unfit for use except for comparative geography.
   2. Conic projections
      a) Bad distortion of shape and area increase northward or southward from the latitude of tangency.
      b) Better method is to intersect the cone and the sphere along two parallels known as standard parallels.
         (1) Lambert's Conformal Conic Projection (Johann Lambert, 1728–77, a German physicist, mathematician, and astronomer, who first applied higher math to trigonometry) based on (*b*); he used parallels 29° and 45°. (U.S. uses 33° and 45°). The meridians are straight lines converging at the poles, and the parallels are concentric circles at right angles to the meridians. Best use is for countries having East-West dimensions.
            i) Lambert's projection methods are used as the basic grid for official aeronautical charts in the United States.
   3. Polyconic projection
      a) This method applies a number of cones successively tangent with or intersecting along different latitudes. A more accurate method. The central meridian is a straight line about which all other meridians are arranged as symmetrical curves. The parallels are nonconcentric circles. It was developed by the United States Coast Guard and the Geodetic Survey for coastal survey mapping without the distortion in latitude shown in other methods.
   4. Projections upon tangent planes.
      a) Gnomonic projection — meridians radiate symmetrically from the pole, and the parallels are concentric circles at uneven intervals — has heavy distortion on lower latitudes. Its importance is that surface points are always a part of a great circle.
      b) Stereographic projection — point of projection is antipodal to the point of tangency to show a larger area, usually a hemisphere. The latitude distortion is not so great either.
      c) Orthographic projection — infinite point opposite the tangent plane — shown as hemisphere maps — the parallels crowd the lower latitudes which increase distortion.
   5. Azimuthal projections (azimuth means direction).
      a) Azimuthal equidistant polar projection — is the same as orthographic polar projection except for evenly spaced parallels of latitude.
      b) Lambert's azimuthal equal-area projection has the meridians slightly curved. Used for large land masses and by the U. S. Geological Survey for base maps of the United States.

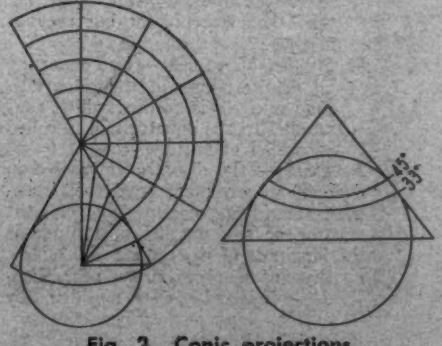


Fig. 2. Conic projections

6. Other types of projection (world maps only).
   a) Mollweides (Karl Mollweide, a professor at University of Halle, about 1800). Homolographic projection is an ellipse of 2 to 1 ratio. The inscribed circle is one hemisphere. Parallels are straight lines evenly spaced. The meridians are ellipses symmetrically arranged about a central straight line meridian.
   b) Goode's Interrupted Homolographic Projection uses several central meridians instead of one — eliminates extreme distortion.
   c) Goode's Interrupted Homolosine Projection
   d) Pole Star map
   e) Five Star map
   f) Cahill's Octrahedral Projection — the butterfly world map
7. Polar perspective alone enables one to appraise the place relations — best in north polar projection as ¾ of all the land masses and 9/10 of the population is in the northern hemisphere. The absence of left and right and top and bottom restores the global impression.

What Do Students Think of Co-operative Education?

Leo F. Smith and Donald K. Beckley***

A study was completed recently at the Rochester Institute of Technology on the question of what our students think of the co-operative work program in effect here. Two hundred and eighteen students from five of our departments were polled by means of a questionnaire to ascertain their attitudes on several of the major issues underlying the co-operative arrangement. Prior to answering the questionnaire the students did not know that they would be asked to do this, and during the time they were filling out the questionnaire they did not have any opportunity to talk over the answers among themselves. Hence it is believed that the answers represent, to a fair degree, the students' real estimate of our co-operative program.

Relationship of Schooling to Work Experience

One of the problems of co-ordination in a co-operative program is in having the students placed on jobs where they will have an opportunity to work in an area directly concerned with the field in which they are studying. Hence in answering the question, "What type of work were you doing during the last work block?" it was gratifying to note that 91 per cent of the students indicated that their jobs were related to their major fields of interest.

In the same connection, the students were asked to indicate the value of their co-operative work in making the schoolwork more meaningful. For the institute as a whole, their replies were as follows:

Degree of clarification due to co-operative work experience	*Total per cent*
Considerably clearer	42
Somewhat clearer	36
No clearer	6
Work had no connection with course	13
Did not answer	3
	100

It is significant to note that 78 per cent of the students replied that their schoolwork had become *somewhat* clearer and more meaningful, or *considerably* clearer and more meaningful due to experiences on the job.

As to the question of the extent to which they had had the opportunity during the preceding work block to apply the theory or laboratory experiences they had learned in school, the tabulation for the institute as a whole was as follows:

59 per cent replied that they had had the opportunity, 24 per cent replied that they had *not* had the opportunity, and 17 per cent did not answer the question.

In a co-operative program one would not expect every student to be able to make applications of his schoolwork every month he was on the job. To achieve such a program would be undesirable in that it would require the teaching of so many specific objectives that the broader principles would suffer. However, students should be assisted in understanding where their schoolwork does apply and in realizing that the understanding of general principles is essential to a long-range balanced program.

In another question, the students were asked: "Has your interest in school changed because of your experiences on the job?" Their responses were as follows:

74 per cent of the students answered that their interest had *increased somewhat* or a *great deal*, 16 per cent of the students answered that there had been *no change* in their interest, 7 per cent of the students stated that their interest had *decreased somewhat* or *considerably*, and 3 per cent

Co-operative students assembling electric interlocking machine at the General Railway Signal Company

*Rochester Institute of Technology, Rochester, N. Y.
**Director, Simmons College, Prince School of Retailing, Boston, Mass.

of the students did not answer the question.

Length of Work Block

One of the subjects concerning which we have been especially interested in, student-and-employer reaction, concerns the length of the work block. The institute had for more than ten years operated on a four-week alternating block plan, and students were asked to indicate the length they considered to be most desirable by checking one of several choices. For the institute as a whole, their answers indicated that:

65 per cent of the students preferred the present four-week block, 30 per cent of the students preferred a block of six weeks or more, 1 per cent of the students preferred a shorter block — generally two weeks in length, and 3 per cent of the students did not answer the question.

Objectives Attained in Co-operative Work

Another question in this survey asked the students to list in order of importance to them the first three of ten objectives which they believed they were most adequately achieving through co-operative education. The table below indicates how the students felt on this question.

Rank order of objectives students feel they are most adequately achieving	*Rank* Men	Women
Financial assistance made education possible	1	8
Understanding of working conditions in industry	2	4
Provided training in occupation	3	2
Practical application of theory	4	1
Increased interest in furthering professional growth	5	7
Increased interest in school	6	3
Increased ability to get along with people	7	5
Feeling of status	8	6
Developed manual skills	9	10
Contacts for employment after graduation	10	9

It is interesting to note that of prime importance to the men is the factor of financial assistance which this type of education provides. On the other hand, the women believe that the objective most adequately achieved is the fact that the experiences on the job provide practical application of the theory studied in school. The rank of importance of these various objectives is of value in contemplating how best to interest prospective students in co-operative instruction.

Weaknesses of Co-operative Plans

In another question, the students were asked, "What do you believe to be the greatest weakness of the co-operative program at the Institute?" This was a free response question rather than a check list. In general, the comments in order of frequency were in these areas: (1) co-ordination between the school and the job, (2) length of the work block or of the school year, (3) the methods of instruction, (4) the heavy class schedule, and (5) the need for more social contacts.

Setting up a job on the milling machine

On the whole, the picture presented by the answers of the students polled is both encouraging and stimulating. Since no record has thus far been found in educational literature of any similar survey being conducted by institutions offering co-operative work programs, the results cannot be compared with those elsewhere.

Some Generalizations

Although the general picture is highly favorable, there are several generalizations which can be made concerning students here, and possibly in other co-operative programs as well:

1. Students feel that there is a definite need for a closer tie-up between the experiences which they have on the job and the major course they are pursuing in school.

2. Regardless of the quality of the training job which some of the students have, they do not by themselves visualize the relationship between the academic and practical experiences.

3. Some students feel that they are placed on a co-operative job and then forgotten.

4. A considerable number of students have the feeling that there should be a very specific connection in each block between the studies pursued in school and the work done on the job. Perhaps this desire for an immediate application of the theory is as prevalent as the opinions so often expressed that there is no connection whatsoever between school and work.

5. A considerable number of students feel the need of either a longer work block (longer than four weeks) or else the opportunity to devote more time to schoolwork.

A blood donor diorama — built by the students of Shaw High School, Cleveland, Ohio

Industrial Arts and Vocational Education
John J. Metz, Editor

DISCIPLINE—THE OLD AND THE NEW

In the good old days — or weren't they so good? — it was the practice in factories to hire foremen who possessed enough brawn to visit physical punishment on workers who failed to do what they were told or who made errors that spoiled material. A purchasing agent of that same era is said to have placed his desk at the end of a long office, facing the entrance door, so that he had an opportunity to stare at and thereby disturb the equanimity of salesmen who came to sell him the things that he really needed. He felt that his job was to browbeat the salesman in order to get him to sell his wares at the lowest price.

In those days, also, it was common that the teacher taught with a hickory stick. A pupil who fidgeted in his seat, or who did not answer as promptly as the teacher expected him to, received a smart crack across the shoulder with the aforementioned teaching aid. With the possession of the stick many of these schoolmasters, no doubt, assumed a pose of severity — a sternness which repelled rather than attracted.

Of course, even in the old days, there were teachers who were affable and kind. One would not think that Socrates when he questioned the youths that surrounded him, would be unduly harsh with them. Neither would one expect any of the great masters to have resorted to artificial poses to impress their students. Real greatness usually does not have to put on an act; its possessors have no time for such makeshifts.

Fortunately for business and for education, things have changed. The strong-armed foreman has made place for a well-poised leader of men. Business executives have found that it pays to treat well those who furnish the materials needed for making a good marketable product. They have discovered that life is too short to harbor bitter thoughts during most of their business hours.

The old-time whip-lashing teacher also has disappeared, and shop, and business, and school, have improved because of these changes.

The opening day of school is the proper time for the shop teacher to devote a few moments of his time to think about the establishment of the right type of relationships with the new incoming students with whom he has to deal for the next semester or two.

The friendly approach will be found to be much more agreeable to both teacher and student. The old saying "Like begets like" is applicable here. Friendliness, justice, and the firm adherence to fair play will usually have a salutary effect on most of the students, leaving the unusual, sporadic efforts of the trouble-maker to be dealt with as the exigencies of the case dictate.

It is well, however, for the instructor to so train himself that the correction of one pupil does not create a depressing atmosphere over the rest of the class. The discipline should affect the one who deserves it, and not those who have had no part in creating the disturbance.

HOW ABOUT THE COMING SCHOOL YEAR?

This issue comes to our readers about two weeks before the new school year opens. It is still time for a little planning, as a matter of fact, for a lot of planning for the school year 1946–47 if none has been done so far.

To many of our readers the first school day holds no terror. They have been through this ordeal again and again. But there are many who have had few, or even no such experiences to their credit. That such teachers should look forward with some trepidation to this first meeting with their new classes is self evident.

The suggestions given here, therefore, although they have been given repeatedly, are again listed to help those who need a little boosting up for the first encounter of the school year with the students who will attend their classes for the remainder of the 1946–47 semesters.

It may be of some assistance to take up first the question: "What will I have my students do during their first class period?" In another editorial on this page the value of establishing an affable teacher-pupil relationship has already been emphasized. It may be well, therefore, to start with the assumption that the students have assembled in the classroom and that the real business of the school year is about to start.

The experienced instructor, of course, is fully prepared for this moment. The beginner may still be in doubt whether he has done all he should to make this first meeting a real success.

To start, then, let us ask a few questions which may point out omissions that can be taken care of by those teachers who want to follow this method in their classes for the coming year.

Have you a large chart displayed on which you have an outline of your course so that you can give your students a preview of the semester's work? Have you a similar chart on which a progress chart is displayed so that students know right from the start how to measure their own progress, and compare it with that of their fellow students?

Have you a chart showing how the various extra jobs, such as cleaning the benches, cleaning and oiling the machines, sweeping the floor, etc., are to be distributed among the members of the class from week to week?

Have you outlined the procedure which the students are to follow when they enter the shop? Have you planned the method which they are to follow for getting their tools, unfinished work, needed materials and supplies?

Have you prepared a brief lesson on safety procedures?

Be sure that all of your explanations are concise and to the point. Some instructors spend the first few lessons in just talking to their classes, forgetting entirely that their new students are eager to get at the tools and materials which represent the activity to be presented in your shop. Be prepared, therefore, to give them some opportunity to handle tools, if not engage actively in using those tools.

If at all possible, give a short demonstration on the first day, and initiate them into what it means to use a tool on a piece of material in following out a preconceived plan.

HAVE YOU A TESTING PROGRAM?

Every mechanic knows the value of checking up his work as he proceeds with a job. If this is good practice when working with inert material, how much more necessary ought it be when the work is with impressionable youngsters who are preparing for life.

Much of the teacher's work produces intangible results. Some of it, however, can be measured with a fair degree of accuracy. Why not use tests to measure that part of the work?

Imperfect as our present methods of testing may be, it is better than not testing at all. Let's make the school year 1946–47 a real testing year.

Teaching Modern Home Wiring Design

*William R. Sorenson**

The most difficult problems in some classes of instruction usually can be traced to lack of student interest in the subject. To combat this, the instructor must constantly strive to make his teaching more appealing to the pupil.

One of the more successful teaching aids used in the instruction of wiring design for the modern home has been a group of blueprints consisting of basement, first, and second floor plans of a model home. These blueprints were drawn up and put into permanent form as a means of bringing to the student a better realization of the demands for adequate wiring in the modern home. Since most of the students come from average homes that are around twenty years old and have very few truly modern features in the wiring system, I have found that the pupils have little idea of what should be included in an up-to-date wiring system.

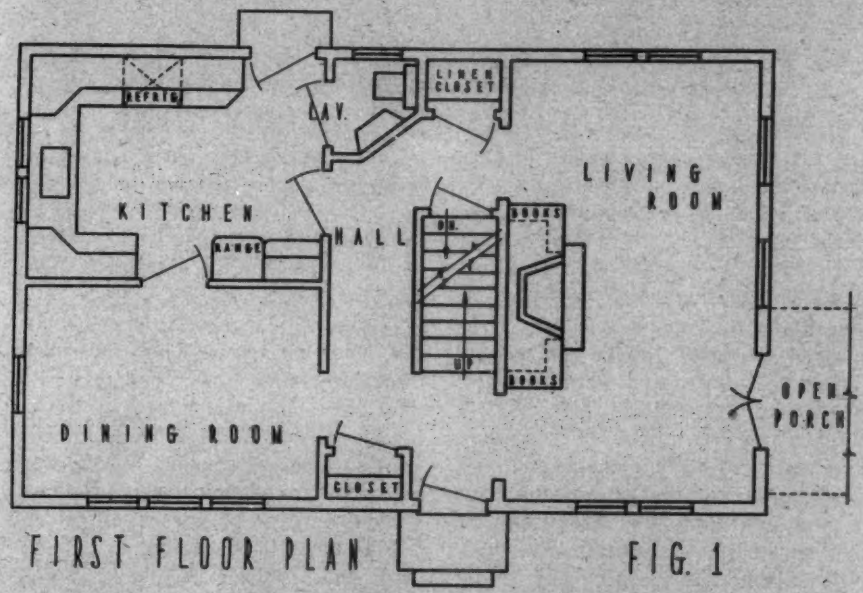
In using these prints I find that the pupil gets a truly clear picture of the various types of outlets, the location of them, the many symbols used in wiring plans, the dividing up of load into suitable circuits, and finally the computation and planning of the service installation.

The study and work on these plans covers a considerable length of time since each step of the work is carefully planned and worked out before the student may progress to the next part. Each step of the work is based on the previous study, therefore, if one phase of the project is neglected the whole job will suffer accordingly.

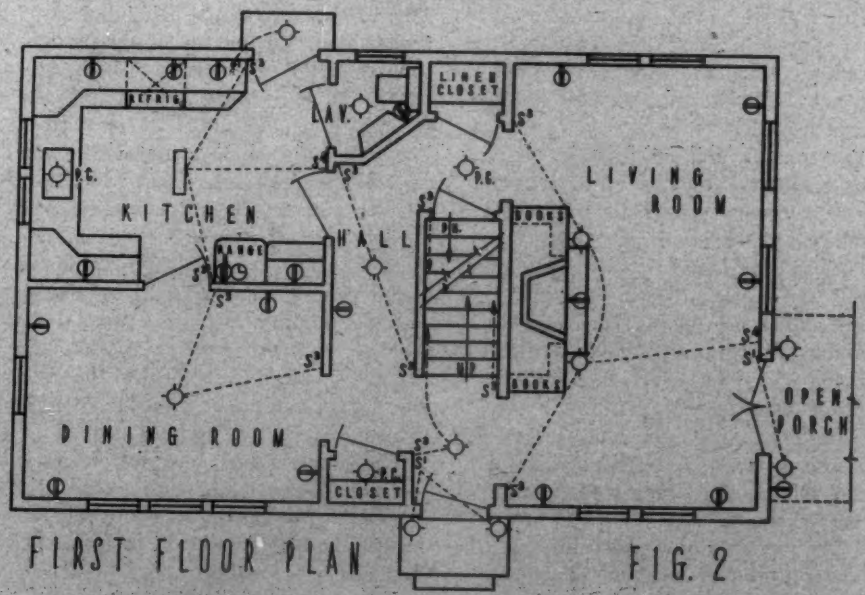
In drawing up the original plans, a typical home was selected, one having the modern features that are being built into the houses of today. The home has six rooms and two baths with a playroom and laundry in the basement. This is not an inexpensive, "cracker box" type house, neither is it too large to come within the scope of the average student.

The three floor plans, consisting of basement, first and second floors, were drawn to scale and included only the building outline and the partitions for the various rooms. No plumbing or electrical plans or details were included. Doors and windows were shown, as well as the locations of such items as kitchen and bathroom fixtures and the basement oil burner. After being drawn up, tracings were made so that blueprints could be provided for each student. Figures 1 and 2 shown herewith merely represent the first floor plan.

One copy of each floor plan is given to every pupil who is then instructed to draw a rough facsimile of each print. This rough copy is to be used for the preliminary planning throughout the entire project. As soon as this has been done the student is ready to begin the wiring design. A study is made of the requirements of the "National Electric Code" concerning the various outlets and their location. This lesson would also include some of the extras, that make for adequate wiring, such as radio, clock, and telephone outlets. Upon completion of this instruction the pupil proceeds at his own speed in the planning of the outlets in his particular house. This would include such important items as the number, nature, and location of all outlets required for comfortable living in this home. (It is well to have the student think of this project as *his* future home.) Each student is allowed to stretch his imagination to the utmost and is told that the cost must not be the primary item of consideration in his planning. It is pointed out to him that the electrical wiring represents only a very small percentage of the total cost of any house, thus fluctuation one way or another to accommodate necessary items is not important and should be allowed. The goal of this work is to produce a thoroughly livable and adequate wiring system. This is very important today since the modern house construction and insulation makes it impractical to add



FIRST FLOOR PLAN FIG. 1



FIRST FLOOR PLAN FIG. 2

*Vocational School, Medford, Mass.

wiring and outlets after the house has been completed.

After this preliminary work has been drawn onto the rough plan it is then thoroughly checked and suggestions are made by the instructor. The outlet locations and symbols are then transferred to the blueprints for that particular floor. This work is done with one of the various white or colored pencils especially made for blueprint alterations. In our department we use complete sets of 12 colored pencils put out by one of the prominent pencil manufacturers.

When the outlets are located for all three floors the pupil is then ready to plan his branch circuits. Here again we must refer to the *Code* for guidance in the planning of these circuits, e.g., the wiring of kitchen, laundry, and dining room circuits. At this time we discuss the many references in the Code that have to do with this subject. We emphasize at this time the numerous references for this single subject and the importance of complying with these rules in the wiring design as well as the actual installation. Also we must consider the regulations of the neighboring municipalities which bear heavily upon this particular subject. The technical aspect of making up the branch circuits may be taken up at this point. This would include the "segmenting" of a house into *circuit areas* which make for a more efficient wiring plan. This would, of course, apply very directly to the actual installation later on, which however may not be within the scope of the curriculum in many schools. Here also the *radial type* wiring system with a load distribution center on each floor should be considered as it is the method best suited for large homes with many branch circuits. The meterboard location must be designated at this time so that the path and direction of the risers may be known to the student. At the conclusion of this study of branch circuit design, and after the rough plan by the pupil has been completed, the entire work should be checked carefully for errors and any changes suggested by the instructor. Here again the student must be given freedom of thought in the planning and as long as the system appears within the rules set up and also practical from a technical standpoint, the pupil's ideas should be utilized. The work should not be tied down to hard and fast lines set up by the instructor, as in this line of work there is room for difference of opinion. In many cases the student has very sound ideas which although not coinciding with the teacher's are quite practical and suitable for use. The pupil should be allowed to think for himself and not depend entirely upon the instructor for every decision. The time will come soon enough, when the boy will be called upon to do his own thinking and planning, and anything that can be done to improve his ability and confidence in this direction should be done.

When all corrections have been made the material must be transferred from the crude practice plan onto the permanent blueprint. Different colors should be used for indicating the various circuits in any given part of the house. This color plan makes it easier for the instructor to check *light* and *heavy* circuits. It also minimizes the possibility of a student leaving part of a circuit not connected to the main section of the circuit, which happens commonly when *roughing in* a house. While this color method is not used in commercial practice, it has advantages from the teaching angle that are quite evident.

As the project proceeds, the details of the installation of the various outlets must be taken up. Modern home construction is such that the old method of the *rule of thumb* variety cannot, for a variety of reasons, be used.

Details of such outlets as the range, telephone, radio, or flushbell types are often puzzling to the student. These items should, therefore, be analyzed and broken down into their various parts and studied for the requirements for installation, stock lists, pricing, and Code rules. The detail of design and finish of the up-to-date kitchen or kitchen-laundry combinations must be taken up at this time to familiarize the pupil with the importance of coinciding the location of outlets with the cabinets, counters, sink, range, and luncheonette area. For this purpose it may be well to draw the four elevation views of a typical kitchen in detail to show what an electrician must consider in the installation of kitchen outlets.

At the completion of the second stage of the project, that of splitting up the load into branch circuits, the student is ready to compute the service wiring. Here again is an excellent time to tie the *Code* up with the other phases of the job. When the service has been computed as per National Electric Code standards, i.e., by the "watts per sq. ft." method and also the load distribution has been designed and planned in accordance with the local rules, the utility company or companies as the case may be must be consulted for their requirements and these incorporated into the final wiring plan. At this point there is a good chance for confusion as one finds (at least in our section) that the three factions, namely, the Code, the local authorities, and the power company do not coincide. The instructor having worked under these conditions usually looks for this confusion and explains the fact that the Code is merely a minimum requirement and does not necessarily reflect the views of the other two parties. This is also explained in the introduction to the National Electric Code book. The planning and figuring over, the pupil is instructed to draw an elevation view of the house. The particular side of the house is determined by the location of the meterboard, which essentially governs the position of the service. In this section, the meterboard location is determined by the utility company, however the instructor also may do this for the students. On this elevation the service conduit (or cable) and the metering equipment is drawn with all specifications and sizes shown. The companion drawing to the elevation is a detail layout plan for the meterboard. It is very important that the student become familiar with the design, layout, and installation of the meterboard and its equipment. Full measurements and specifications should be made in accordance with the power company rules as well as the local authorities. This step completes the study and has carried the student through the entire procedure of planning the wiring for a modern home. We could go further and include the total cost, estimate of time and labor, complete stock list, etc., however that is another complete project in itself and is not included in this study. The information collected and transferred to these house plans can very easily be used as a basis for a number of additional projects for future study in this direction, however.

It has been my experience that this is a most interesting way of teaching the design and drafting of a home wiring system, due to the fact that the pupil is encouraged to use some of that imaginative power that is sometimes neglected. Of course some boys tend to go to extremes, but they are in the minority. Besides being of interest the project is effective in a number of different ways some of which I will list below.

a) It commands and holds the students' interest.

b) It challenges the imagination of the pupil.

c) The plan has a systematic approach and procedure toward the completed project.

d) Details are unearthed that might otherwise go unnoticed.

e) The pupil may proceed as fast as his ability permits.

f) The student becomes more familiar with the reading and drawing of building plans.

g) It forms a foundation for future study.

This approach also may be used for other branches of work that are difficult to bring into the average classroom, such as, store lighting and factory power distribution study. This method falls in line with the project method of teaching used in most vocational schools and can easily be adapted for use with electrical drafting students.

On V-J Day the Apprentice-Training Service had record of 16,706 establishments with apprenticeship programs for the training of building trades craftsmen. At the end of May, 1946, this number increased to 32,303.

The New England States showed an increase from 509 to 719, and New York State an increase from 301 to 677 during the V-J Day to June 1 period. — *William F. Patterson*, Director, Apprentice-Training Service, U. S. Department of Labor.

What—To Be or Not To Be

*Hyman Goldstein**

The question of what occupation to engage in customarily faces the youngsters being graduated from our public schools and colleges. Not only do they not know usually what to do but they generally do not know what to do about it. As a consequence, there has come into importance the work of the vocational guide or counselor. Since he is concerned with the problem of helping to correct instances of unadjustment or maladjustment in industry he assists the individual seeking guidance to select from a variety of possible occupations that particular type of work which will be most in accord with the abilities, aptitudes, desires, and needs of the individual. Vocational counseling is primarily interested in the individual's vocational well-being and happiness so that his lifework may bring him the greatest possible self-expression and self-satisfaction.

We are well aware of the fact that no two individuals, not even twins, are alike in abilities or personality characteristics. The differences among individuals even in such a commonplace aptitude as the speed in picking up iron pegs and placing them in holes is astounding. Of course, when the matter of intelligence is studied in groups of individuals there is found a tremendous range in intellectual capacity.

Since individuals are so different among themselves, it stands to reason that the only way to accord to each of our youngsters the equality of opportunity for vocational adjustment is to recognize that they are all different, that they need individual attention, and that their vocational programs should be based not on mass formulas or parental pressure but on the findings in each individual case.

The vocational guide has by experience and training become acquainted with the intellectual capacities, skills, and aptitudes that are required for successful adjustment in the various, broadly established occupational categories. He has found that the different vocations demand different abilities, both in quality as well as in quantity. After he has charted the abilities, aptitudes, and personality traits of the examinee, the counselor is able to superimpose this chart upon the chart of qualities required by the particular vocation in which interest has been shown. To secure as nearly perfect a match as possible is, of course, the aim of guidance since it tends to indicate in advance how adequately one's abilities will fulfill the demands of a particular type of work.

*Psychologist, New York State Vocational Institution, West Coxsackie, N. Y.

Not only do youngsters of 14 or 15 need and seek vocational guidance (since true guidance can usually be brought about at this age) but adults in their fifties and sixties who have been hard hit by depressions, recessions, and crashes also find in guidance an answer that attempts to obtain for them something more than just bread and butter. We have but to witness the rather amazing success of the Adjustment Service in New York City that gave free counseling to 10,000 unemployed or maladjusted individuals several years ago. The majority of these unfortunates were, of course, adults who had had many years of work experience prior to seeking guidance. It has been found that age is not very important in learning new trades. Old dogs *can* be taught new tricks in the way of occupational readjustment even if the factors of gray hair, eyeglasses, false teeth, or a doddering gait appear to be insurmountable. The mind at 60 remains practically as keen as it was at 16!

It must be admitted that guidance does not point to *specific* jobs, such as *short order* cook, *cigar store* clerk, or *organic* chemist as being the primary objectives in job training or seeking. Rather it attempts to predict with reasonable assurance whether the individual will, for instance, be more successful along academic, clerical, or mechanical lines. To try to give successful vocational guidance and prognosis in greater detail is hazardous and extremely difficult since no single test or battery of tests has, as yet, been developed that would enable more adequate prediction. In the light of the test results, the interests shown in the life history of the examinee and shown by the results of interest tests, the occupational conditions in industry relative to demand and supply, and the peculiar and particular factors surrounding each person seeking guidance, a list of work possibilities that promise best vocational adjustments are set up for consideration.

The vocational counselor claims no mystical powers and he performs no sleight-of-hand. He cannot tell you with any measure of certainty whether you're destined for success or doomed to failure. Success in the work chosen cannot be guaranteed. It is well known that success and failure depend upon too many factors outside of the control of the individual, such as chance, job opportunities, family prestige, and so forth, as well as other factors relating to ambition, "go-getterness" (which cannot, as yet, be measured, etc.), to be predicted accurately and finally. Any or all of these are apt to upset the applecart of predictions. What is true for success is equally true for failure, namely, some achieve it while others have it thrust upon them.

Although this degree of guidance may not be specific enough for some tastes and individuals we must remember that the only other alternative is trial-and-error. This means trying out as many occupations as possible until you hit the one that conforms most nearly with your own individual and peculiar set of abilities and make-up. Just think what this means! Job after job, year after year, heartaches, disappointments, discouragements, weariness in endless monotony. Should you be persistent enough to try a sufficient number of jobs and should you be lucky enough to find the "right" job you would probably be too old and decrepit to enjoy it.

Who shall survive, the moron or the genius? Both, because the satisfactory carrying on of the 20,000 different occupations by the men who do the world's work requires all levels of intelligence. In fact, this age has rightly been called the "golden age of the moron" because the division of labor and industrial specialization that we have inherited from the machine age has made the use of intelligence almost unnecessary in some cases. Certainly, watching the wheels of a machine that whir on without end or pushing a lever now and then does not place too great a strain on intellectual capacity. "A job adequate to the moron," says Walter B. Pitkin in *Life Begins at Forty*, "can always be found; one suited to the average man is seldom far to seek; but work that demands the highest mentality always has been rare and is growing rarer relative to the world population and to the volume of the world's work." Mental functioning does, however, enter into all types of work, from street cleaner to stringmaker, from laborer to linguist.

It has been found that a high intelligence does not in itself mean success at work nor is failure indicated in advance by a low intelligence. This is true because success in the different occupations demand different degrees of intelligence depending in large measure on the complex nature of the work. It is obvious that only goals which are attainable should be set up and aimed at if we are to prevent countless instances of frustrations, inferiority complexes, and other manifestations of personality disorders that arise from continued failure. From some individuals no more may be expected than being able to operate a drill press while from others who are intellectually more gifted the complicated operation and management of a linotype machine may reasonably be expected. In any given broad category of work there may be found people with low, average, and high intellectual levels. In some cases the differences in intelligence may be quite considerable. It must be remembered, however, that a broad category of work such as that of chemistry, for instance, may cover the range of occupations all the way from the laboratory

assistant who washes bottles and performs the simplest routine operations to the director of chemical research in charge of the co-ordination of the work of many other chemists responsible to him.

Since a high intelligence does not necessarily mean success at work, then what does? Interest in one's job appears, at times, to be of greater importance than superior intelligence in terms of the economic value of the employee to his firm. This is so because job interest and efficiency are quite often related. It has been found that an interest in and a desire for a specific vocation may sometimes compensate for intellectual mediocrity, that morale, interest, and purpose are of prime consideration in this matter of vocational guidance. Countless instances of the failure of college graduates in industry may be attributed to a lack of interest in their work. A liking for one's job appears to be something that is not necessarily purchased by a pay envelope.

An individual, in order to be happy from a vocational standpoint, should generally be allowed to pursue the occupation within his limitations and abilities for which he shows interest. Interests, however, like intelligence, are not pointed toward particular jobs but rather toward a generalized category of occupations. Thus, interest in the automobile may in one case lead to the position of truck helper, in another to that of auto mechanic, in another to that of car salesman, and in still another to that of writer of treatises on the historical evolution of the automobile engine. Such other factors as physical strength, mechanical aptitude, personality, business acumen, *salesmanship*, research ability, writing facility, and so forth would help to make a final decision.

In recent years it has been determined that certain occupations tend to attract and to keep vocationally adjusted individuals with certain personality make-ups. Vocational adjustment always means emotional adjustment to the job. It is, therefore, of the greatest psychiatric importance that each individual should be placed in an occupation that will not thwart his personality, that will give him, according to Donald A. Laird in *Why We Don't Like People*, "an opportunity to live his personality — provided, of course, that he has a healthy personality balance at the start." This means, for instance, that the person who is slow and easygoing in manner, methodical and precise in response, and slightly retarded in physical activity should not usually engage in work that requires quick thinking, hasty decisions, and hurried action. Where a person tends to be seclusive and introverted, preferring to work alone and away from people it is quite evident that he will be maladjusted and unhappy in work requiring many social contacts, visiting customers or prospects, and making it necessary for him to be a good mixer, a man-about-town, or just somebody that can always be depended upon as a fourth hand at bridge.

Progress up the vocational ladder depends to a greater extent upon personality than upon intelligence. This has been verified by studies showing that there is a much greater correlation between personality fitness and income than between intelligence and income. (Of course, income may be no intrinsic criterion of vocational progress but it is the one generally accepted by most people.) Personality fitness depends upon the possession of such traits as sociability, leadership, sympathy, sincerity, self-sufficiency, and so forth. Since some aspects of personality can be cultivated and developed and since intelligence is theoretically constant for a given individual the moral of this paragraph is quite obvious.

In vocational guidance the individual differences in physical capacity are given careful consideration. We know that different occupations vary considerably in the physical strains and exertions that they impose upon and demand from the worker. We also know that individuals vary still more considerably among themselves in their physical constitutions and energy outputs. Here again it is a matter of matching as nearly as possible the demand against the supply. A physical weakling can hardly hope to be successful as a stevedore whereas an embryo Tarzan may be quite lost stitching trousers on a factory sewing machine.

At birth we are not labeled carpetmakers, ditch diggers, or bank tellers. Individuals cannot be vocationally pigeonholed by vocational counselors or anybody else. There is no such thing as vocational predestination. Any attempt to encourage the belief in such tommyrot is sheer deception. Most of us can do many things well because we are fitted by natural endowments and acquired aptitudes to do more than just one thing. How well we do these things will depend upon the arousal of enough interest, the development of good work habits, the ability to get along with people, and the possession of a healthy personality that allows normal outlooks on life and work.

There is more than one way to kill a cow. Similarly, there are many avenues to success just as there are many gateways to failure. Success depends perhaps more upon the individual than upon the specific work in which he engages. It really makes little difference to the majority of individuals what specific work is chosen just as long as the general occupational level they select matches the general level of their abilities. The factors of interest, financial prospects, working conditions, and so forth, aid in making the final choice from the occupations that are suitable.

Vocational maladjustment is no respecter of persons. It is found among the rich and the poor, the ignorant and the educated, the young and the old. However, the extent to which it appears in various groups differs. Among the men of accomplishment it is least common. Generally the form of vocational guidance that they have employed has been self-guidance which enabled them to start planning their careers early in life. There has been unearthed plenty of evidence to show that, generally speaking, success is intimately related to life planning. Four out of every five men listed in *Who's Who* felt at an early age the urge to map out their future lifework and develop ways and means to reach their goal. Similarly, lack of life planning and failure seem to go hand in hand. A study of our delinquent and indigent populations usually reveals a woeful lack of perspective and a failure to *look ahead* in earlier years. The nonutilization of actual and potential abilities is no less an economic waste to the individual and to the nation than the neglect of our natural geographic resources.

Any planning is better than no planning at all. But planning, to be effective must be scientific and logical. There is no evidence, however, that vocational guidance is a cure-all for our vocational ills or for mediocrity or that it is a preliminary for one and all before landing in *Who's Who* or *American Men of Science* or what have you. But it is a fairly reliable way to assure happier and saner working lives. It helps the masses of our industrial population as well as the few who achieve national prominence. The maladjusted and the unadjusted are both usually able to see the way once they are given light. They improve in status, efficiency, and in personal feelings of self-satisfaction and self-confidence.

Guidance provides only light, nothing more. It is necessary that the individual himself must work hard, must adjust, and must develop from within so that success on the job becomes not something to fall unexpectedly and by chance into his lap but rather the logical outcome in a cause and effect sequence. Hard work will always be the price to be paid for success, be it for genius or moron. There is no substitute for it in any form of trade, business, or profession. It is most likely to yield results when it is accompanied by those personal qualities, such as sincerity, sociability, tactfulness, leadership, etc., which enable us to get along well with our fellow workers.

Despite the fact that there is always some unemployment and insecurity prevalent, it is becoming increasingly apparent to those who must guide and direct the choices of people looking for a lifework that merely earning a living is not enough. The welfare of the individual and of society depends upon the realization of the maximum efficiency of which the individual is capable, no matter who he may be or what he may do. It is only when men and women know themselves that they may become truly wedded to their art, that they may achieve the happiness of self-realization.

The driver's vision was obscured in one out of every five fatal accidents in 1944. Approximately 40 per cent of these visual obstructions were caused by snow, sleet, or rain. — *National Safety Council.*

Vocational Guidance in the School Shop

*Robert L. Mohle**

Vocational guidance is one of the big problems that confronts the shop teacher. Most of the boys who take shopwork in high school never go on to college. Therefore, it is very important that the shop teacher know something about guidance.

Then too, the shop teacher has a better opportunity to find out just what the boy can do and what sort of background he has. These two facts are the most important in the field of guidance.

The instructor must also keep up with industry so that he will know what type of jobs are open and the demand for men to fill these jobs. He also must know what industry is doing so that he can offer his shop courses so that they will give the boy the best training possible. Shop courses cannot be offered exactly the same, year after year, on account of this fact.

It is desirable for the school to maintain contacts with the local business firms and manufacturers so that the graduate may be placed in jobs whenever possible.

The main thing for the instructor to remember in planning his course is that: "The qualities the new worker needs are alertness, responsiveness, an intelligent grasp of the operative parts; in short he must be an all-round mechanic rather than a specialized hand."[1]

The specific vocational guidance problem is the adjusting of personality to the job situation. Such adjustment means:

1. Adjustment to work;
2. Adjustment to social conditions at work;
3. Adjustment to working conditions other than social;
4. Adjustment to the life pattern characteristic of the occupation.

Failure, when it comes, as it too often does, should not be laid to the wrong choice of an occupation. Maladjustment is usually caused by one or a number of the following factors:

1. An inability to do the job
2. Social ineffectiveness, which is seen in
   (*a*) Failure to get on well with superiors,
   (*b*) Failure to get on well with inferiors,
   (*c*) Failure to work well with associates,
   (*d*) Inability to adjust oneself to the life pattern of the occupation.
3. Misunderstanding as to the true nature of the vocational world;
4. Lack of an intelligent philosophy of work;
5. A failure of the job rather than that of the individual.

A good plan for the guidance counselor to follow is to compile a list of vocations which the students of that locality are likely to follow and under each vocation to list:

1. Courses of instruction at the school which are considered essential to preparation for the vocation named.
2. Courses of instruction which are considered desirable, but not necessarily essential.
3. Advanced professional or technical training required.
4. Sources of information concerning entry into the professional fields of employment.

A course of vocational guidance should be set up in every high school because teaching for vocational life means helping the student to develop habits and techniques and attitudes which make it possible for him to advance through the progressive solution of vocational life problems. The functions of the class in guidance might roughly be described as follows:

1. Supplying information and the means of obtaining information;
2. Teaching the skills essential in solving vocational problems;
3. Teaching the concepts essential to vocational understanding;
4. Teaching attitudes which will facilitate vocational progress;
5. Stimulating, encouraging, and developing the power to solve problems;
6. Helping the student to establish values — to form some conclusions as to what he should expect and demand from vocational life;
7. Helping him to discover the values which life possesses and find them through planned vocational adjustment.

Vocational guidance should present the skills, techniques, understandings, and appreciations necessary to make intelligent decisions; through counseling, it helps boys and girls make decisions; through placement, it assists them in making and supervises early contacts with industry.

*Hyattsville, Md.

[1]Lewis Mumford, *Technics and Civilization* (Harcourt, Brace, 1934), p. 227.

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LET US HAVE PEACE

The war is over, and yet the war has just begun. The same selfishness which got beyond control in Europe and Asia and necessitated the interference of those who have risen at least a little above savagery is about as rank as ever. During the international conflict the majority in this country decided to adjourn temporarily the bitter strife within the nation in order to present a united front against the Nazis. Now that the war has been officially declared at end, the classes and the races have reopened their conflicts. They style their action an effort to advance democracy, but it looks more like self-extermination.

While in most of the so-called democracies the strife is one of classes, in the United States the conflict is a mixed comedy of clashes of both races and classes. Sometimes the conflict presents the troublesome aspect of being both class and race conflict at the same time, for those devoted to racial strife may or may not be interested in class strife and vice versa. But almost everybody in the country is busy trying to prevent someone from attaining a status which he believes the aspirant should not have. Many who demand democracy for themselves would not like to see persons of another race enjoy that boon.

In the United States the situation is very discouraging. Although we have just emerged from a life-and-death struggle, brought upon the world by the effort of a lunatic to exalt his race above all others and bring the universe under its domination, in the city councils, in the state legislatures, and in the Congress of the United States we have men who have taken the leadership in advancing the selfsame doctrine. Most of them first directed their destructive efforts toward the Negro, but now they are attacking the Catholics, Jews, Italians, and the Russians. History shows that, if the mischievous element be permitted to attack one part of the population, it will soon advance to the position of making war on others.

To justify the injustice done the Negro the Americans in and out of Congress resort to malicious falsehood in saying that the Negro is an inferior race which has never developed a civilization. The "proof" which they advance is that during the three hundred years that the Negro was held in slavery and peonage in the United States he failed to equal the white man who kept him in bondage. The purpose of Negro History Week is to invite attention to the Negro in all parts of the world and to show that even when in bondage the record made is not to be despised. We must broaden our conception of culture and learn enough about the other fellow to appreciate his point of view. In this way and in this way only can we build a democracy which the world of tomorrow will accept. — *Carter G. Woodson*, Editor, *The Journal of Negro History*.

Although only 7 per cent of the population of the United States is over 65 years of age, 64 per cent of the victims of falls are in this age group. — *National Safety Council.*

Hernia in Industry

*Dr. Waldemar Schweisheimer**

Handicap Can be Overcome

An industrial worker, along with a helper, carried a heavy case from one room to an adjoining room on the same floor. He felt a sharp pain in his left groin, and saw a kind of lump at the same spot. The immediate medical examination revealed the presence of a hernia at the site of the pain — the pain itself had disappeared meanwhile.

That sounds simple, but it may be very complicated to state whether the worker actually suffered the appearance of a fresh hernia, or whether the hernia was present for years and now had grown worse, possibly through the strain; or whether only a slight inclination to a hernia was existent which developed to a real hernia through the lifting of the heavy burden. Undoubtedly some more medical checkup and a lot of paperwork will be done before the compensation of the case has been determined.

For decision of those and many other questions connected with the problem of industrial hernia is not easy.

What is a Hernia?

The term hernia or rupture is usually applied to the protrusion of a loop of intestine through a weak spot on the muscle wall of the abdomen. We cannot see this loop, it is covered by the usual layers of skin and fat; all we see is a small lump in that region, under the skin. Normally the muscles of the abdomen are one firm, tightly closed wall. But sometimes there are weak spots, small gaps between the fibers of those muscles, and here the content of the abdomen may press forward. The examining finger feels the muscle gap; sometimes a weak pressure of the finger is sufficient to make the lump disappear: the loop of the intestine has been pushed back into the abdominal cavity where it belongs.

There are certain favorite locations where hernias are frequent: inguinal hernias, in the groin near the thigh; femoral hernias, just below the groin, on the thigh; and umbilical hernias, in the navel region. Inguinal hernias are much more common in men, while femoral hernias are more common in women, and umbilical hernias are much more frequent in children, particularly infants. Most industrial hernias are of the inguinal variety.

We are frequently told that hernia is largely a disease of workers in heavy industry, but this is not correct. Many desk workers who never have to lift anything heavier than a blotter have had a hernia for a long time. That hernia is slowly progressive and may be unsuspected for years. Loss of weight, whether voluntarily by a reducing diet, or involuntarily by economic distress or old age or sickness, may diminish a fat deposit around the muscle gap in the abdomen. Thus, the way for occurrence of a hernia is prepared.

The weakness in the muscle wall exists frequently from childhood, and a violent exertion, a sudden strain, the lifting or pushing or pulling of a heavy burden may enlarge the gap and produce a real hernia. While lying down, the loop recedes into the abdomen but it emerges again when the man is getting up. Coughing and sneezing and every violent strain makes the lump appear again.

Responsibility for Industrial Hernia

There is no doubt that there is a definite link between physical strain and occurrence of hernias, but many other influences obscure the picture. Compensation claims, therefore, cause no little embarrassment, doubt, and discussion. H. Bartle says the responsibility may properly be divided 50–50 between employee and supervisor, negligence on the part of the employee and improper supervision. A person with a hernia, he says, should not work without a proper mechanical support or radical cure by surgery. He believes strongly in operation: it restores or rehabilitates a handicapped person, lessens human discomfort and removes a possible hazard. Routine pre-employment physical examination and later repeated periodic examinations help toward increased safety.

More than 13 million physical examinations of selective service registrants (up to 1944) have given new statistical figures. According to a report of Colonel Leonard G. Rowntree, hernia was the principal cause for rejection in 5.7 per cent — altogether some 230,000 cases. Among the youngest registrants, 18–19-year-old, the percentage of rejection for hernia was 1.6 per cent. In contrast to the first few years of induction, most registrants with inguinal hernias were later subject to induction. Within the army the men with hernia were either operated on or carried under limited service.

How Many Workers with Hernia in Industry?

Industry, which in former times did not like to employ the handicapped worker, has recognized meanwhile that many workers with handicaps may be as efficient as normal workers and may even be safer if they are properly trained, placed, and supervised. A publication of the War Manpower Commission has considered the use of handicapped persons in industrial work; a tabulation of the estimated number of persons with various types of impairment listed 1,186,000 with hernia.

According to Coyer and Widder, a Pre-Medical Examining Board for all applicants for work at a naval supply depot found that the incidence of hernia was high. Roughly one man in five had or was in a position easily to contract a hernia condition. Incidentally, hernias were more frequent on the right side than on the left — and hernia was more prevalent in the white than in the negro workman.

A report of McGee and Cregar on gastrointestinal diseases among industrial workers showed that 23 per cent of the absenteeism resulting from those diseases were due to hernia and related conditions. The prevention of illness in industry, the authors say, is undoubtedly a concern of both management and labor, the industrial physician and the individual employee.

Similar were the rejection figures because of hernia in a survey of industrial rejections made by the Public Health Service in ten munition plants. While the average rejection rate for applicants reaching physical examination was 7.6 per cent, 21.8 per cent of those rejections were made because of hernias.

Robert H. Flinn in a study on the maximum use of man-power outlines examples of recommended procedure under three heads. To the first group "Handicaps suitable for immediate placement" he assigns symptomless hernias. To the second group "Handicaps calling for temporary rejection until treated satisfactorily" he assigns severe cases of hernia which cannot be reduced. The third group makes unfit for employment. Hernia is not enclosed in this last group because it can always be cured or improved by surgical procedure.

Hazards of Hernias

Certain hazards and complications may be connected with hernias. They are comparatively rare, and many people who had hernias during decades or during their whole lifetime, never experienced any complication at all. However, the hazard exists, and the everyday way of living and working has to take care of it. Sometimes it is not possible to return a hernia into the abdomen by the ordinary gentle pressure. Another, worse complication is that of strangulation from the neck of the hernia; it interferes with the blood supply and in the case of the intestine, with the passage of the bowel contents, even a gangrene (death of part of the tissues) may result from such strangulation, and to prevent it, immediate operation becomes a must.

*New Rochelle, N. Y.

Fortunately those risks are a small minority. People who have had a hernia for a long time, know very well how to return the hernia by lying on their back, bending their thighs, using cold compresses and using very gentle pressure. However they are frequently worried and distressed by their condition.

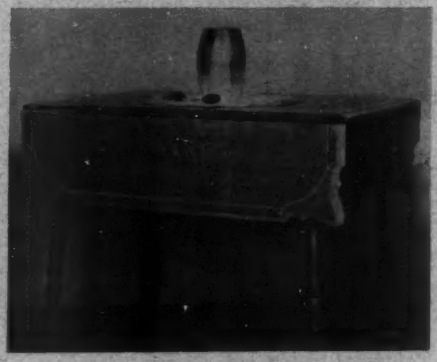
Overcoming the Handicap

The modern method of curing a hernia by operation is by far the best treatment for hernias. In 95 out of 100 cases the chances are that the operation will cure the condition permanently and will restore full working capacity and industrial efficiency.

Trusses are frequently used in lighter cases for retaining the hernia. The common type consists of a piece of flat spring steel, covered with leather and with a firm pad at one end to fit over the muscle gap through which the hernia would emerge. Trusses are frequently a source of annoyance, particularly in summer time. The truss should be made to measure and selected with care since, if the fit is not satisfactory, it will be both inefficient and uncomfortable. A well-fitting truss may do its job though it rarely brings perfect satisfaction.

A treatment for hernias frequently mentioned is the Injection Method. The injections are supposed to narrow and obliterate gradually the muscle gap through newly grown tissues. The method seems to have a certain attraction for industrial workers by the chance to continue with their work while receiving the injection treatment. The American Medical Association did not consider the method suited for general use, and Johnstone who seems rather skeptical with regard to lasting results, found from the literature that the method can be accepted only for carefully selected cases. Most doctors are convinced that today the operation of the hernia is the best possible method to overcome this handicap.

Recently the question was discussed in the *Journal of the American Medical Association* whether a truss should be routinely furnished to all workmen engaged in laborious lifting as a preventive measure against development of inguinal hernia. The *Journal*, through its expert, said: a truss will not prevent a hernia. Inguinal hernias are congenital (existing from birth) in origin and will probably develop in spite of a truss. Furthermore, a truss to prevent hernia would diminish the efficiency of the industrial worker.



Kitchen table submitted by Harry L. Barta, Bay View High School, Milwaukee, Wis.

Problems and Projects

INSPECTING MACHINE WORK IN A GENERAL SHOP

FLOYD M. DICKEY
Industrial Arts Instructor
John Adams High School
South Bend, Ind.

The shop of John Adams High School in South Bend, Ind., is classified as a general shop, in which the following activities are carried on: machine shop, woodwork, graphic arts, crafts, foundry, forging, electricity, and sheet metal. The average class size is from 32 to 35 students. About one fifth of the students are girls, which is a little different from most shops in that only boys are thought to be able to master these skills. The problem of checking and grading students' work when there is a varied program is a difficult task if it is to be done correctly. We have developed an inspection project that works and is a distinct help to the instructor.

Our machine-shop work for the first four semesters is based mostly on exercise work that later develops into projects. This type of instruction is somewhat of a carry-over from the war-production methods of training. Most of our exercises are designated as letter series, such as *D* series or *X* series, as shown in the accompanying illustrations. Each boy is given a small tray in which to keep his work, and which is to be used when he hands it in to be inspected.

Figure 1 shows how the *D* series plus the *X* series, when completed, equals a *T* handle tap wrench. Each boy makes four of the *D* series and hands in his work to be inspected at the end of each step. By this method we have six grades in the making of the body of the tap wrench. Another student may be working on four pieces which we call the *X* series. He hands in his work to be checked at four different stages. Upon completion of these series, the pieces are assembled and each student is given credit for a completed project. It is believed that by repetition, the student learns more machine operations than he would by making a single project.

Before a student starts his work, or is issued any material, he must make a working drawing of the series he is to make. These drawings are kept in our planning room where facilities are provided for making drawings.

Fig. 1. The D and X series of exercises

Fig. 3. The inspection bench

The drawings must be OK'd by the instructor, and the student must hand them in with the rest of his work when it is to be inspected.

Each student in the machine shop has a number which he stamps on each piece of material. This helps to prevent the students from mixing their work. When handing in four pieces to be inspected, the student also stamps *A, B, C,* etc., on each respective piece for the purpose of identification when inspected. After he finishes the work that is shown on his working drawing, he fills out two inspection blanks like the one shown in Figure 2. To fill in the inspection report, the student places his number, job number, and date in the proper blanks, and places it with his work and working drawing in the top shelf of the inspection bench. The inspection bench has a top shelf where the students place their work to be inspected and some lower shelves, where the inspector places the work after it has been checked. See Figure 3. The inspector fills out, on the top line of the inspection report, the measurements which he is checking on this certain job. The letters, *A, B, C,* etc., on the left side of the blank indicate the different pieces which have been checked.

Inspection Report

Student's No. .... *Job No.* .... *Date* ....

A
B
C
D
E

No. Measurements..... Grade.....

Fig. 2. Inspection blank

An advanced machine-shop student is selected by the instructor to be his inspector. The secret of a good inspection program lies in the proper selection of the student inspector. The inspector has a separate set of inspection instruments, which includes micrometer, calipers, scales, depth gauge, taper gauges, ring gauges, thread gauges, plug gauges, snap gauges, etc. After the job has been inspected, he fills out the reports showing which measurements are within the tolerances, and returns the job and one inspection blank to the student; the other blank he places on the teacher's desk to be recorded on a progress card. The students are asked to keep inspection reports to show that certain jobs have been completed in case there is an error in the recording of his grade on the progress chart. In case of a low grade, the student may correct his work, if it is possible, and hand it in for a second inspection.

The inspector has a rating scale that he uses for grading. This rating scale is made up by the instructor for each job. For example, there are eight measurements to be checked, and if the student gets all eight correct within the tolerances, he receives an *A* on his work. If he has seven measurements correct, he receives a *B*. If he has five or six measurements correct, his grade is a *C*. If any rating is four or below on an eight measurement scale, the student is required to do the work over.

At times the inspector is kept rather busy because he checks out the material for students of six classes. Several of the jobs are checked with fixed gauges and this simplifies the inspection work. In case of a special job, or where unusual inspection is required, the instructor does the grading. When the inspector is caught up on his work, he spends his time recording grades on progress charts and working on new gauges and inspection material.

We have tried this system in our shop for the past several semesters and find that it works very well. Some may criticize the fact that the student doing the inspecting isn't learning much machine work, but after a semester of work of this kind, he has developed an adequate technique in the use of inspection instruments.

ORNAMENTAL TIN CRAFT

CHRIS H. GRONEMAN

Industrial Education Department
A. & M. College of Texas
College Station, Tex.

(Continued from page 265 of the June, 1946, issue)

Picture Frame

To make the picture frame described herewith, considerable patience and skill are required. The metal is one piece of single thickness 30-gauge sheet tin fastened to a 3-ply wood back with escutcheon pins or roundhead copper brads. The frame shown in the half tone was left in the natural tin finish with a lacquer preservative coating. It is very attractive also when the tin has been copperplated.

The heavy radial lines running to the points of the star are chased with a cold chisel. It

Fig. 1. Picture frame

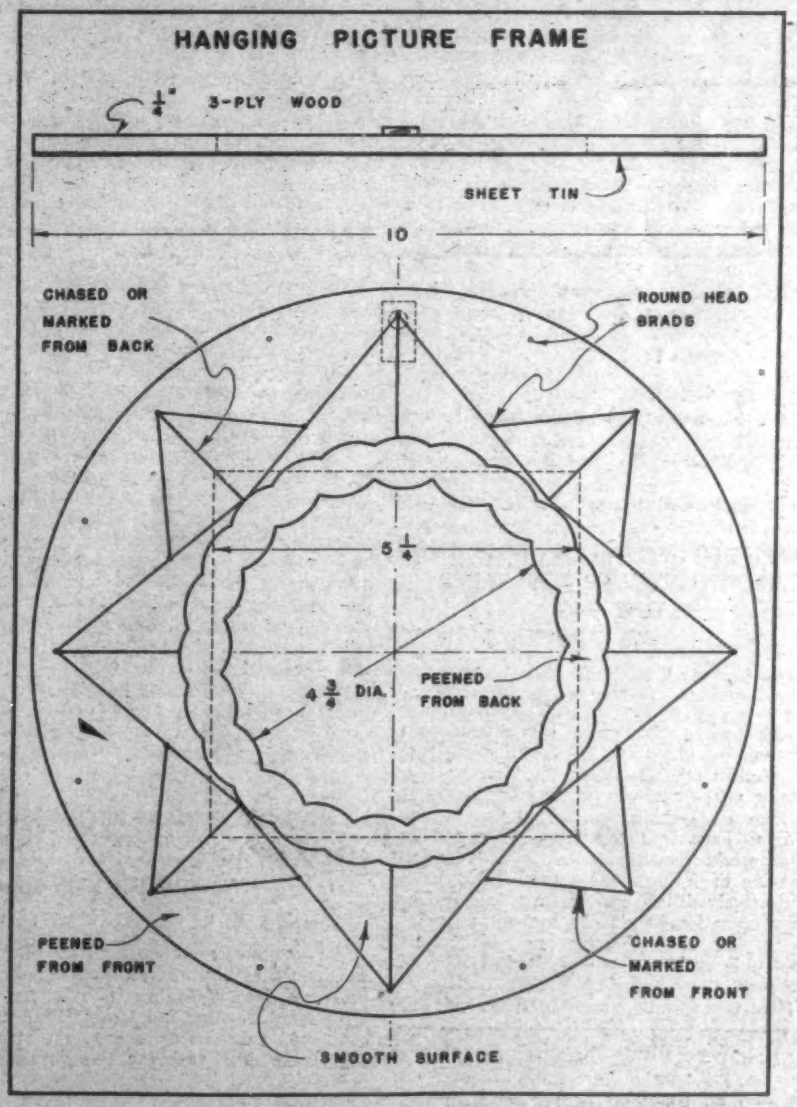


Fig. 2. Details of picture frame

should be noted that a portion of the design is peened from the back, and part from the front of the sheet. The design illustrated is only suggestive because there are as many designs as there are designers and craftsmen.

BILL OF MATERIALS

No. of pieces	*Item*	*Size*
1	Sheet tin	10¼ x 10¼
1	3-ply wood	¼ x 10¼ x 10¼

Tools: Brush, carbon paper, cold chisel, coping saw, emery cloth, file, jeweler's saw frame and blade, lead or wood block, peening hammer, pencil, rule, scriber, yellow tempera water color paint, tin snips, and necessary tools for making wood back.

Procedure:

1. Make and finish wood backpiece.
2. Use design as shown in the drawing, or develop an original design.
3. Cut sheet tin to outline size with tin snips.
4. Apply coat of yellow tempera water paint to one side of sheet tin for design transfer.
5. Lay design sheet and carbon paper over painted portion and trace design.
6. Drill hole and cut out opening with jeweler's saw frame and blade. This process may also be accomplished by placing the sheet tin between two pieces of thin plywood and cutting with jig saw.
7. File and dress edges with emery cloth.
8. Mark or chase straight lines as shown in the drawing.
9. Peen portions indicated on lead or wood block. Note: Part of the peening is to be done from the back side.
10. Mark and drill holes for fastening to wood back.
11. Polish front of sheet tin preparatory to application of lacquer or copperplating.
12. Fasten sheet tin to wood back with brads.
13. Trim points of brads extending beyond wood and file smooth.
14. Make and attach picture frame hanger or hook.
15. Apply coat of stain to edge of wood back.
16. Apply coat of clear metal lacquer.

SIMPLIFIED FORMULA FOR TAILSTOCK SETOVER FOR TAPER TURNING

HARTINGH W. BABCOCK

Detroit, Mich.

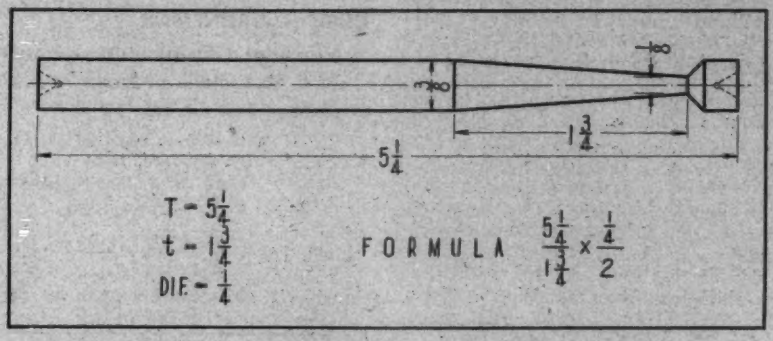
The common way to cut tapers in the school machine shop is by the tailstock setover method. The big objection that the typical student offers to doing any kind of taper turning is the necessity of figuring the setup. If there is anything that the student dislikes it is to have to take time out for tedious paper work. Usually he has so little understanding of formulas of any sort that he is instinctively driven away from them all. The lathe operation handbooks are not of much use to him either because they are usually written in such a way that they are beyond the pupil's understanding.

Here is a formula that is very simple.

$$\frac{T}{t} \times \frac{DIF}{2} = \text{tailstock setover}$$

T = total length of workpiece
t = length of taper on workpiece
DIF = small diameter subtracted from large diameter of taper
2 = always appears in the formula because the amount of movement of lathe tool and work to each other must always be divided by two, because the tool cuts from both sides of the work

In presenting the formula it is put on the blackboard and an imaginary job is sketched with it. For example the sketch of a center punch might be used:



Turning a center punch

The important points to call the student's attention to are (1) the greater ease and accuracy of working with decimals rather than fractions and (2) the simplicity of treating the two sides of the formula individually so it becomes:

$$\left(\frac{5.25}{1.75}\right) \times \left(\frac{.25}{2}\right) = 3 \times .125 = .375$$

Now the decimal is matched with the fraction nearest to it on the decimal equivalent chart which, in this case, is 5/32. The tailstock setover is made with a rule.

To enable the pupil to retain the formula for future use the class repeats the following several times: Big T divided by little t times the dif divided by 2.

Big T is naturally the *total* or over-all length of the work. Little t refers to the *taper* itself which is usually less than the total length so it is a small t. Dif is always the abbreviation for difference and, of course, the only difference in the job is between the two diameters of the work. The 2 is old stuff to the operator because he knows that the amount one wishes to remove in a cut on the lathe is always divided by two, and the cross-feed dial then turned in that amount.

Here is a formula that is useful to a lathe operator. The factory toolrooms use the tailstock setover method very often so the student is prepared when he gets into industry.

BASIC AIRCRAFT PROCESSES

ALBERT KOSLOFF

On leave from Waller High School

Chicago, Ill.

The permeation of most phases of American industries into aircraft work has brought processes into the aircraft industry which are related to other industries. However, because the fabrication is done on materials that were developed for the airplane, the processing is definitely representative of aircraft work.

There are many processes in the airplane industry. Some of them are peculiar to aircraft work alone and were developed by aircraft people, while some have been borrowed from other industrial fields. The term process in this article refers to work that involves different skills.

The interpretation of industry is one of the major objectives of industrial arts and vocational education. Since processes catering to an industry determine the skills that are necessary to stress in training workers and in interpreting that industry to pupils from a general educational viewpoint, they assume important implications for the supervisor and instructor.

The following list with definitions of processes arranged in alphabetical order represents many necessary skills. Some of the processes require few skills; others are very complex and demand many. It should not be assumed that the list presents all the aircraft processes.

It is hoped that the list will serve as a guide in obtaining more information about each of the numbered items.

1. ***Air compressing*** is a process in which air at atmospheric pressure is drawn into a container and compressed and then used for operating such tools, as rivet guns, squeezers, screw drivers, air drills, and the like.
2. ***Alclading*** is a controlled process in which a thin layer of commercially pure aluminum is applied to surfaces of aluminum alloy sheets in order to prevent corrosion.
3. ***Anodizing*** is an electrochemical process in which aluminum alloys and magnesium surfaces are coated with an aluminum oxide coating to give the aluminum alloy resistance to corrosion, to obtain electrically nonconductive surfaces, to serve as a base for paint, and to aid in discovering cracks.
4. ***Beading*** is the forming of small corrugations, with the aid of machines, in sheet metal in order to stiffen and strengthen the sheet.
5. ***Bending*** in aircraft work involves the changing of shapes of sheet stock, bars, tubes, and angles by the use of power brakes, hand brakes, finger brakes, bar folders, tube benders, jigs, and presses.
6. ***Blanking*** is a method of cutting given sections from sheet metal with a solid punch and a corresponding die.
7. ***Bonding*** is the process in which all the metal parts of an airplane are electrically connected to prevent building up of static charges, to obtain a low resistance path when necessary, to minimize lightning damage, and to minimize radio interference.
8. ***Brazing*** is the joining of two or more metals with a molten alloy called spelter that melts at high temperatures.

9. *Bucking* is a process in which the shank of a rivet is backed up with different types of metal tools known as bucking bars, while the head of the rivet is formed on the shank.

10. *Buffing* is a process whereby surfaces are polished by power driven circular disks made of muslin, felt, leather, and the like.

11. *Burnishing* is work in which slight scratches in metal are removed by rubbing the scratched part with the smooth and polished surface of another metal.

12. *Burring* is the removal of turned up or sharp projecting edges of metal which result from drilling, cutting, sawing, routing, and the like, with such burring tools as files, rotary files, drills, countersinks, scrapers, and rotary sanders.

13. *Caulking* is sealing of crevices and openings after the parts are assembled in order to make an airplane, hull, or float watertight, airtight, and heatproof.

14. *Chromating* is the application of zinc chromate in liquid or paste form, generally to metal surfaces, by means of spray guns or by hand.

15. *Cleaning* in aircraft work is done with castile soap and water, tested commercial cleaners and solvents that will not corrode parts, and with vacuum cleaners.

16. *Closing of doors* is a process in which access doors, inspection doors, cargo doors, and the like, are fitted and installed on the airplane with screws, bolts, snaps, fasteners, or hinges.

17. *Coding* is the standardization of aircraft parts or the application of varied colored bands to tubing, wiring, rubber hose, rods, and the like for recognition purposes.

18. *Counterboring* is the enlarging of the diameter of a hole to part of its depth by boring.

19. *Countersinking* is the cutting of a conical recess at one end of a drilled hole so that the head of a rivet or screw will fit exactly into the cut recess and be flush with the surface.

20. *Crimping* is the fastening of electrical terminals around electrical wires with crimping pliers and other tools.

21. *Cutting* in aircraft work is done with aviation snips, power shears, square shears, throatless shears, and different types of dies.

22. *Die cutting* consists of sheering materials into desired shapes by such operations as punching, piercing, cutting, dinking, and blanking with the aid of dies.

23. *Dimpling* is a process in which holes that have already been drilled in sheet metal are pressed with dies in such a way that rivet heads will fit flush with the surface of the sheet metal.

24. *Drilling* is the cutting of different size round holes in materials with drills that are held in radial drill presses, multiple spindle drills, radial arm drills, portable drills, hand drills, and turret bench drills.

25. *Doping* is a process in which airplane fabric covering is brushed or sprayed with a finish known as a *dope* to make the fabric taut, airtight, and watertight.

26. *Drop forging* is the fabrication of metal parts from bar or rod stock by placing heated stock in a die and applying blows with the aid of a machine hammer upon the stock in the die.

27. *Extruding* is a process in which a semimolten metal is forced through a die to provide a shape of desired cross section.

28. *Fastening* is the process of holding parts designed to be opened or removed at certain intervals with such fasteners as sheet-metal screws, clips, snaps, and the like.

29. *Filing* is the cutting away of metal with all types of hand files, rotary files, filing jigs, and filing machines.

30. *Filleting* is the attaching of fillets between airplane wings and fuselage, or the application of zinc chromate paste inside of corners in such structures as hulls, floats, and tanks.

31. *Flaring* involves the bending of the ends of tubes in such a way that a watertight or airtight joint is obtained when the tubing is installed in aircraft fittings.

32. *Forming* is the shrinking, stretching, corrugating, and the general fabrication of sheets into desired shapes with the aid of punches and dies, forms, jigs, mallets, and sandbags.

33. *Greasing* is the application of specified aircraft greases to movable and rotating fittings.

34. *Grinding* is the cutting or removing of material by means of abrasive wheels.

35. *Hammering* is the shaping of metal parts by bumping, striking, or hitting the metal with different types of hand hammers, drop hammers, and pneumatic hammers.

36. *Hardness testing* is used for determining the hardness of metals and other materials by methods such as Brinell, Rockwell, Barcol, Webster, and the like.

37. *Heat treating* consists of the operations of normalizing, annealing, aging, hardening, quenching, tempering, casehardening, carburizing, and nitriding, which have as their aim the improvement of the physical properties of aircraft metals.

38. *Inspection* in aircraft work involves the examination of tools, parts, small assemblies, major assemblies, raw materials, processes, finished product, preflight inspection, and maintenance procedures to see whether work is done according to given specifications.

39. *Korosealing* is the process of tying together tubing, electric cord, and other parts with a material known as "koroseal" so that the harmful effects of vibration are diminished.

40. *Lacing* is the tying together of bundles of wires with waxed cord or the tying of tubing or other parts with cord to lessen effects of vibration.

41. *Lapping* is a process in which soft metal of required size and shape is coated with a rubbing or cutting compound, and is then rubbed against a piece of metal from which a very small amount of metal is to be removed.

42. *Layout* is a process in which a part or pattern is first drawn or scribed on a material before the part can be made.

43. *Leveling* involves putting the airplane in a neutral flying position so that certain types of instruments can be installed.

44. *Liquidometer calibration checking* is a process in which a solvent or aviation fuel is poured into tanks of an airplane to see if liquidometers are registering the correct amount of fuel, oil, or solvent in tanks.

45. *Lofting* is a process in which lines of an airplane are drawn or laid out full size on metals which serve as templates for making the parts and tools that are needed to form and shape the assemblies of the airplane.

46. *Magnetic inspection* or *magnafluxing* is inspection of ferrous metals in which flaws that ordinarily cannot be seen with the naked eye are detected with the aid of magnetic lines.

47. *Masking* involves the covering of a part with masking paper or tape to prevent damaging adjacent parts and to protect material upon which work is done.

48. *Measuring* in aircraft work is done with rules, protractors, micrometers, vernier calipers, telescope gauges, ball points, depth gauges, thickness gauges, patterns, indicating gauges, plug gauges, radius gauges, thread gauges, surface plates, snap gauges, and bevel protractors.

49. *Metalizing* or *metal spraying* is the spraying of a molten metal onto another metal with a combination torch and spray gun.

50. *Moisture proofing* is the installation of plugs or bags of chemical compounds into engines, hulls, floats, and other parts of airplanes to absorb moisture and humidity that may develop inside the parts.

51. *Molding* is a process in which an article is reproduced from a pattern or die with the aid of heat and pressure.

52. *Paralketoning* is the application of a black, greasylike compound to control cables to prevent the cables from corroding.

53. *Patching* is a process in which repairs in the form of flush, overlap, and stressed patches are riveted to aluminum alloy skin; or fabric repairs are attached to fabric; or outside, flush, and splay patches are made on plywood structures of wood parts of airplanes.

54. *Pickling* is the cleaning of metal parts by immersion in an acid solution for a given time.

55. *Planishing* is the smoothing of rough spots on sheet-metal parts by hand with hammers, or with pneumatic operated machines.

56. *Plating* is the application of a thin coat of corrosion resistant metal, usually electrically, to aircraft metal parts that are subject to corrosion.

57. *Polishing* is the cleaning of metal and plastic parts with polishes by hand and with rotary machine polishing wheels in such a way that cleanliness and transparency are obtained without damaging cleaned surface.

58. *Profiling* is the cutting of metal parts to a given profile or pattern with a machine known as a profiler.

59. *Priming* is a process in which the first coat of paint, generally zinc chromate, is applied with a spray gun or by hand to airplane parts and structures.

60. *Reaming* is the accurate finishing off of drilled holes by hand or machine with tools known as reamers.

61. *Rigging* is the aligning of airplane controls and the adjusting of engine, propeller, and other cables in order that the airplane will maneuver correctly about its axes, and connecting parts to controls will react according to specifications.

62. *Riveting* is a method of joining in which rivets of different shapes and sizes are inserted in drilled holes of two or more metal sheets or parts, and the shank of the rivet is squeezed, bucked, or hammered down by hand or with pneumatic rivet guns to form a permanent clamping action on the sheets.

63. *Rolling* is the forming of sheet metal, tubing, extrusions, rods, and the like, on rolling machines to obtain a desired curve.

64. *Routing* is the cutting of a part to a given contour with a rotating cutter.

65. *Safetying* is a process in which bolts, nuts, studs, turnbuckles, and other parts that have a tendency to loosen because of vibration and movement are secured with cotter pins, safety wire, jam nuts, elastic stop nuts, etc.

66. *Sandbag bumping* is the forming of sheet metal into desired shapes by holding the metal over a sandbag and forming the

sheet by hammering it with mallets and hammers.

67. *Sandblasting* is a process that deals with the cleaning of parts by blowing sand, steel, and other abrasive grit against the surfaces to be cleaned.

68. *Screw driving* is the driving of screws with plain screw drivers, cross slot screw drivers, electric screw drivers, and automatic screw drivers.

69. *Sewing* is a process by which airplane fabric is attached to such airfoils as ailerons, flaps, elevators, rudders, tabs, wings, and stabilizers.

70. *Skinning* or *stripping* is the cutting and removing of insulation from electrical wiring.

71. *Spark testing* is a method of recognition of metals by observing the pattern and color of spark streams given off when a piece of the metal is pressed against a grinding wheel.

72. *Spinning* is a process in which metal sheets and tubes are formed by means of tools pressing against the revolving metal to form circular symmetrical shapes.

73. *Splicing* is the joining of two cables by interweaving the parts of the cables in such a way that both cables are joined into one cable.

74. *Squawking* is the listing of faulty work and defective parts in the final inspection of an aircraft job, completed assembly, or completed airplane so that defects can be remedied.

75. *Stamping* is the identification of parts by impressing them with rubber stamps, steel dies, grease pencils, and etching equipment.

76. *Striping* is the painting of an overlapping stripe, usually in red, over a nut and bolt to show that the nut has been torqued or tightened to a required force.

77. *Swaging* is a process in which a fitting is secured to the ends of a wire cable by inserting end of cable into hole of fitting and pressing the fitting around the cable with dies so that cable and fitting almost weld together.

78. *Swamping* is the signaling between a floor man and a crane operator in the moving of heavy aircraft parts and assemblies or hoisting of airplanes.

79. *Tapping* is the cutting of threads in a drilled hole by machine or with hand taps.

80. *Testing for leaks* involves putting air pressure in oxygen lines, fuel lines, oil lines, fuel tanks, oil tanks, etc., for a given time and a given pressure, and applying soap solution to all connecting joints and parts to make sure that tested parts do not leak.

81. *Threading* is the cutting of threads on the outside surface of a round rod by machine or with hand dies.

82. *Timing* is the adjusting of units of an aircraft engine in such a manner so as to produce a spark at the proper instant in proper relation to piston and crankshaft position.

83. *Torqueing* is the tightening of a bolt, nut, or hose clamp with a tool called a torque wrench to a given force in inch-pounds or foot-pounds.

84. *Tube forming* is a process in which aluminum alloy and stainless steel tubes are bent into various shapes with tube benders, jigs, sand, and machines.

85. *Welding* is the joining of metal by fusing two or more pieces of metal by any of the following methods: gas welding, spot welding, arc welding, and butt welding.

86. *Winding* is the process of wrapping insulating tape on heavy cable, flexible conduit, and bus bars.

87. *Woodworking* in aircraft work includes processing of wood by means of gluing, planing, sawing, nailing, routing, bending, finishing, filing, patching, forming, veneering, screw driving, sandpapering, and testing.

TIN-CAN PHOTOGRAPHIC ENLARGER

A. G. BELESON

High School of Science

The Bronx, New York City

The photographic enlarger, shown herewith, was built to be used with an old folding camera. The dimensions given may be altered to suit the camera that may be available.

To Make the Enlarger

The small can *A* is used as a ventilator. See Figure 1. Locate the center of the top of the can and drill a hole large enough to permit the ⅛-in. pipe nipple to pass through. Then near the open end of the can drill six ¼-in. holes spaced evenly on the circumference of the can. These holes are to permit the heat from the bulb to escape without permitting light from the bulb to escape.

The large can, five-quart size, must have the damaged end cut out. The can then must be wiped clean and dry. Locate the exact center of the sealed end of this can and drill a hole large enough to permit the ⅛-in. pipe nipple to pass through. Also drill six ¼-in. holes on the circumference of a circle which has a radius of about 2½ in. This can be seen in Figure 1, where the assembly of the ventilator to the light housing is shown. When both of these cans are assembled, the vent holes are at right angles and only the heat can escape. These two cans are then assembled by the socket, the ⅛-in. pipe nipple, and the lock nut.

Cut a disk to fit the open end of the 5-quart oil can. This must fit snugly. The diameter of the can used was 6½ in. Then cut a square hole 4 by 4 in. out of the center of this disk *C*. Drill four holes evenly spaced to permit the fastening of this disk *C* to the bottom piece of the light housing *D*. When cutting out your wood, parts *E* and *D* must be the same.

Cut a hole in the center of part *D*. This hole is also 4 by 4 in. A rabbet is then cut to fit a piece of ground glass 4½ by 4½ in. The depth of the rabbet will depend upon the thickness of the glass.

The ground glass is held in place by fastening part *C* to part *D* with four No. 8 by 1½-in. f.h. screws.

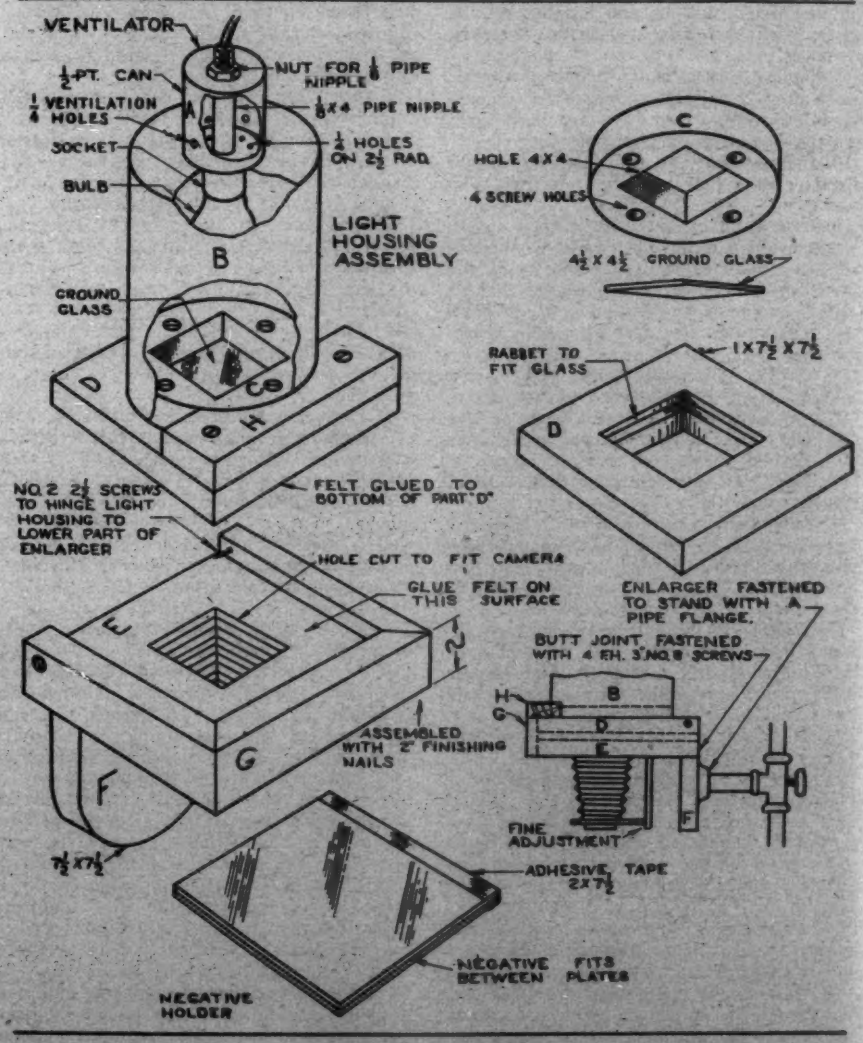


Fig. 1. Details of the enlarger

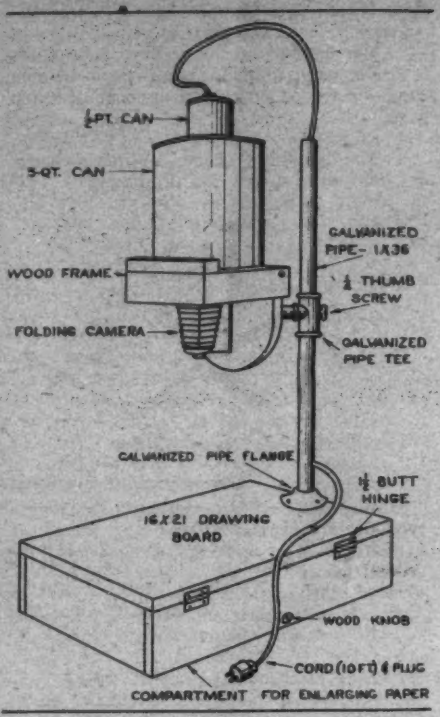


Fig. 2. Assembly of the enlarger

Now assemble the lower part of the enlarger. Cut the frame *G* to fit part *E*. The corners can be mitered or butt joints. Fasten part *F* to *E*. Use four No. 8 by 1½-in. f.h. screws. The camera must be carefully fitted to part *E* before assembly of parts. The frame *G* is assembled with No. 16 by 2-in. finishing nails. All nails are set below the surface and the holes filled with wood putty. Fasten the pipe flange to part *F* as shown. Fit the pipe nipple into the flange. Drill and tap a hole into the ⅛-in. T, to fit the ¼-20 thumb screw.

Assemble the drawing boards and frame. Fit the parts carefully together. The construction of the bottom is optional, depending upon the ability of the individual. The corners can be rabbeted, mitered, or butt jointed. The framework for the compartment for the enlarging paper will have the right side or may have the left side hinged. This will depend upon the individual. You will find this compartment handy when you begin to do some enlarging.

Fasten the pipe flange as shown and then screw the long piece of pipe into the flange. A hole must be drilled into the lower end of this pipe to permit the electric wire to go through it. Now you can fasten the lower part of the enlarger onto the stand.

Cut two pieces of clear glass 7½ in. square. It is advisable to cut the glass a bit smaller to insure proper fit into the enlarger. Tape these two pieces together on one edge only. Now the glass is hinged together. This is your negative holder. Place the negative holder on the lower part of the enlarger. Cut a mask to fit the negatives. Place the mask between the two glass plates. Now fit the upper section of the enlarger so that part *D* fits directly over part *E*. Fit part *H* to the upper part of the enlarger and then fasten it in place with 4 No. 8 by 1½-in. f.h. screws. All screws are fastened into part *D*. Now locate the position of the screws which will enable part *D* to hinge on the lower part of the enlarger, as shown in Figures 1 and 2. The screw holes should be located about ½ in. from the end.

Felt may be glued into the enlarger to take up any space between the light housing and the negative holder.

To test enlarger for proper light diffusion, expose a piece of 5 by 7-in. enlarging paper to the light of the enlarger. If the glass diffuser is ground properly, even exposure will result when the test piece of enlarging paper is developed.

The light housing *B* may be fastened to part *C* with two No. 3 by ½-in. r.h. screws, if the disk *C* does not fit snugly.

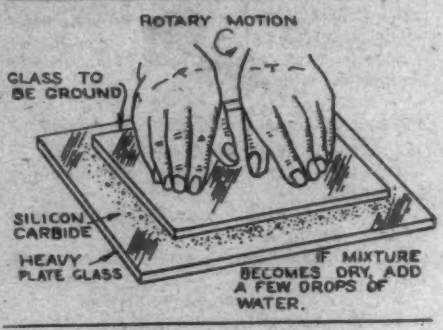


Fig. 3. Making the ground glass for the tin-can photo enlarger

How the Ground Glass May Be Made

1. Obtain a 2 by 2-in. piece of heavy plate glass.
2. Place under faucet and wash plate glass clean.
3. Place plate on bench, wet it with water, and sprinkle a small amount of No. 150 grit silicon carbide on it.
4. Place glass to be ground on the plate glass as shown in Figure 3.
5. Grind with a rotary motion.
6. Grind glass until the entire piece is no longer transparent. Wash glass and wipe dry. Check glass for even grinding.
7. Repeat operation using finer grit of silicon carbide — first No. 220, and then FF.

INDUSTRIAL-ARTS TRAINING PROGRAM

A. U. RASMUSSEN
Niles High School
Niles, Mich.

Junior-senior high schools now have an opportunity to expand their shopwork. This can be done without increasing the teaching staff. Due to decreased enrollment in senior high, there are two alternatives: (1) The industrial-arts teachers will fill in their load with academic classes for which they are qualified, or (2) more shopwork is made available for junior high school, where enrollment is growing.

At Niles Junior-Senior High School seventh- and eighth-grade boys were organized into a new crafts-shop setup. Two senior high industrial-arts teachers instruct one class each day. One teacher has two more classes daily. There are up to twenty pupils in a class. Mechanical drawing and sketching are taken up first, followed by woodwork and metalwork. This arrangement prepares the boys for ninth-grade woodwork and the senior high industrial arts.

In drawing, learning to measure correctly is stressed. Then, when wood and metalwork is started, it is easier for the pupils to plan and work on their projects. New workbenches have been installed and the tool scarcity has been relieved by borrowing from a surplus in other shops. Adjustment to projects requiring a small amount of wood, yet retaining application of fundamental operations also has been resorted to. In metalwork scrap stampings from a local factory and tin cans have helped provide material. Individual planning books are used by each student. A household mechanics text and reference books are also used.

Objects of the crafts shop are to learn:

1. Desirable work habits, personnel duties, and safety practices.
2. To conserve tools, materials, and equipment.
3. To plan simple projects and work with plans.
4. Elementary drawing and sketching.
5. How to use and work with basic wood and metalworking tools.
6. How to measure, lay out work, and finish to dimensions.
7. How to use simple finishing procedures and materials.

HOW BIND THE BOOK?

R. RANDOLPH KARCH
Intertype Corporation
Brooklyn, N. Y.

There are as many ways to bind a book as there are to skin a cat. One can spend a few cents for a saddle-wire binding, or a few dollars for a case-bound and gold-stamped binding. Possibilities are almost endless.

Shown and explained here are the more typical methods of binding in conventional, loose-leaf, and mechanical styles.

A study of these methods will aid the book planner to select the particular type of binding most suitable for the job at hand.

Conventional Binding

General Features:

1. For books in which pages need not be added or removed.
2. For books of a more permanent nature.

Saddle-Wire (See Figure 1.)

1. Simplest and cheapest form.
2. For books of small thickness, from 8 to 32 pages.

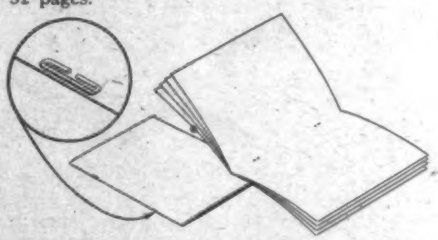


Fig. 1. Saddle wire

3. Cover and pages held by two or more stitches.
4. Lies flat when open for ease in reading.
5. Inside margin can be small.
6. Bleeds can be used through fold.[1]
7. No backbone; merely a fold.

Side Wire (See Figure 2.)

1. A simple and cheap form.
2. For books up to ½ in. thick, in sizes from 5 x 8 to 9 x 12 in., from 32 pages up.
3. Cover usually glued on in one piece front and back.

[1]Bleed: when illustrations run off the edge of the page.

4. Does not lie flat except in the very large sizes.
5. Inside margin must be larger than that used in saddle wire.
6. Bleeds not good through the backbone of the book.
7. Backbone of a wrap-around cover can be printed.

Sewed Soft Cover (See Figure 3.)

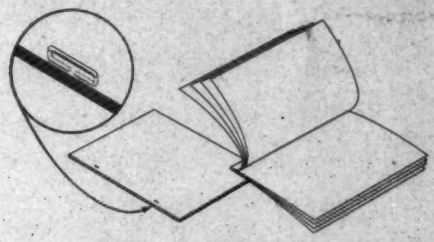


Fig. 2. Side wire

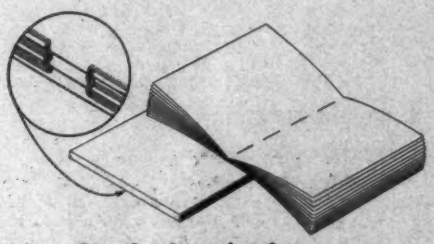


Fig. 3. Sewed soft cover

1. More expensive than saddle wire or side wire.
2. For all books of any size, but usually thick books.
3. Cover usually glued on in one piece, front and back.
4. Lies flat when open for ease in reading.
5. Inside margin can be small.
6. Bleeds can be used through the backbone.
7. Backbone can be printed.

Sewed Case Bound (See Figure 4.)

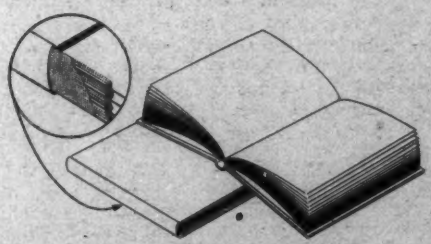


Fig. 4. Sewed case bound

1. Most expensive of bindings, generally speaking.
2. For all books of any size, but usually thick, heavy books.
3. Cover usually cloth-covered binder's board.
4. Lies flat when open for ease in reading.
5. Inside margin can be small.
6. Bleeds can be used through the backbone.
7. Backbone can be stamped with title.

Loose-Leaf Bindings

General Features:

1. Sheets may be removed.
2. Sheets may be added.
3. Complete binding not necessary. Sheets may be selected and bound to suit the needs of the particular reader, as in catalogs where the reader is interested in only part of the products manufactured.
4. Sheets may be torn out without spoiling the binding and releasing other pages, as in saddle-wire books.
5. Presswork runs may be saved by printing all color pages in one form. This is made possible because the book need not be printed in signatures (folded sections).

Loose-Leaf Types:

The more common types are shown and explained here: binding post; binding post, tongue cover; and ring binder.

Special types not pictured here are explained as follows:

Mechanical Loose-Leaf Types:

1. "Multo," made up of multiple rings.
2. "Streamliner," consisting of continuous metal rings.
3. "Swing-O-Ring," metal rings having a scissors' action.
4. "Tally-Ho," having wire rings on a steel plate.
5. "Tubak," a series of metal rings.

The typical loose-leaf binders pictured here are explained as follows:

Binding Post (See Figure 5.)

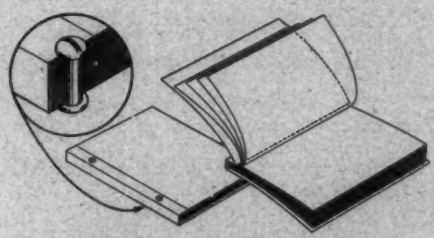


Fig. 5. Binding post cover

1. Loose-leaf features as explained.
2. Does not lie flat — must be held open when read.
3. Large margin necessary for binding edge.
4. Binding post exposed.
5. New sheets not so easily added.
6. Readers are discouraged in taking out sheets.

Binding Post, Tongue Cover (See Figure 6.)

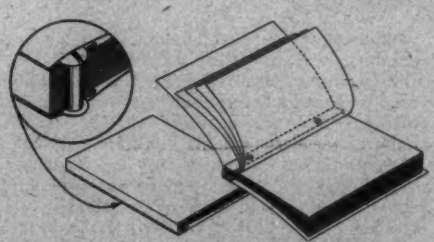


Fig. 6. Binding post, tongue cover

1. Loose-leaf features as explained.
2. Does not lie flat — must be held open when read.
3. Large margin necessary for binding edge.
4. Binding posts concealed.
5. New sheets not so easily added.
6. Readers are discouraged in taking out sheets.

Ring Binder (See Figure 7.)

1. Loose-leaf features as explained.
2. Lies flat for ease in reading when open.
3. No large margin necessary at binding edge — more paper can be used for printed page.
4. Rings exposed, inside.
5. Best binding available for quick change or addition or subtraction of sheets.

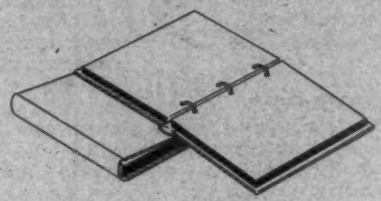


Fig. 7. Ring binder

Mechanical Bindings

During the past ten years the *mechanical* type of binding has risen in the estimation of purchasers of bindings because of these general features:

General Features:

1. Odd-sized sheets and pages may be used.
2. Books always lie flat when open for ease in reading.
3. Most mechanical bindings are rugged and stand harsh handling and are comparable to sewed books.
4. Good color schemes are possible.
5. Some mechanical bindings may be printed.
6. Sheets may be added on some mechanical bindings.
7. Sheets can always be torn out without affecting the other pages in the book.
8. Books need not be printed in signatures (sections of 4 or 8 pages or more) thus saving in the number of press runs on color pages.
9. Complete visibility over all the pages. No part of the page is concealed within the binding.

Two of the more popular types of mechanical bindings are the *plastic* and the *spiral*. Many others, based on the same principle in whole or in part are explained briefly, but not pictured here.

Plastic (See Figure 8.)

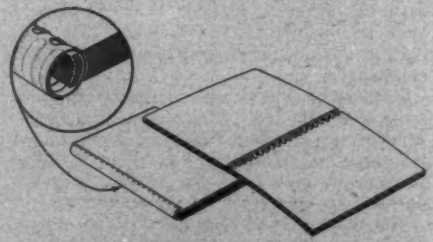


Fig. 8. Plastic binder

1. Possesses the general features just explained.
2. New sheets can be *combed in* when slot punched, but do not hold as well as the original sheets.
3. Backbone may be printed.
4. Good color schemes are possible.
5. A strong, sturdy backbone.
6. Stiff or soft cover may be used without affecting the rigidity of the book.
7. Will not fold over on itself like the spiral type.

8. Opposite pages register well at the binding when the book is open.

Spiral (See Figure 9.)

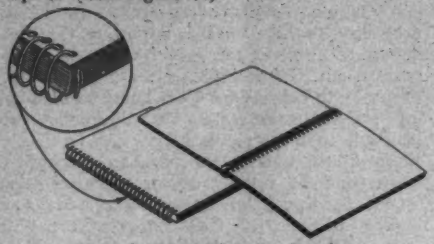


Fig. 9. Spiral wire binder

1. Possesses the general features of all mechanical bindings explained in the foregoing.
2. Backbone cannot be printed, because it is made of a wire coil.
3. Good color schemes are possible with the plastic-covered wire called spiralastic.
4. A strong, nonflexible backbone is possible only if a stiff cover stock is used.
5. Folds over on itself for ease in reading.
6. Opposite pages are out of register when the book is open.

Mechanical Bindings Similar to Plastic and Spiral:

1. "Aligno," wire loops spaced at intervals.
2. "Cercla," flat metal rings.
3. "Cerflex," flat plastic rings.
4. "Cerlox," connected flat, plastic rings.
5. "Coil," a single coil of wire.
6. "Flex-O-Coil," three-wire coils.
7. "Gee-Gee," single loop wire.
8. "Kamket," continuous single wire.
9. "Limited," metal rings, riveted to a backbone.
10. "Overwire," wire coil within the cover.
11. "Parallex," a single or a double-loop coil.
12. "Royal," partly concealed plastic tubes.
13. "Supra," concealed plastic tubes.
14. "Tauber Tube," flat plastic rings.
15. "Tubak," metal rings.
16. "Wire-O," double wire loops.

ALUMINUM LETTER OPENER

AUGUSTINE J. BREZINA

School of Education

New York University

New York, N. Y.

The letter opener described in this article is an interesting metalworking project which gives the student an opportunity to employ his creative ability and skill in producing a useful, attractive, desk ornament. Aluminum was chosen as the working medium because of its present abundance, cheapness, strength, lightness, workability, and brilliant luster. Surplus materials and scrapped airplanes provide a lasting supply of the material in various shapes and sizes for use in the school shop.

The student is encouraged to do his own planning and designing, and may at his own discretion attempt several of the possible design variations shown in Figure 1. The work involves several techniques, among which are designing, sawing, filing, decorating, polishing, and lacquering.

The material required for the letter opener is 24ST aluminum, or any other type of hardened aluminum stock. The original blank for the letter opener should be approximately ¼ in. thick, ⅞ of an in. wide, and a little over 10 in. long. The ¼-in. thickness was selected because it seemed to give the best

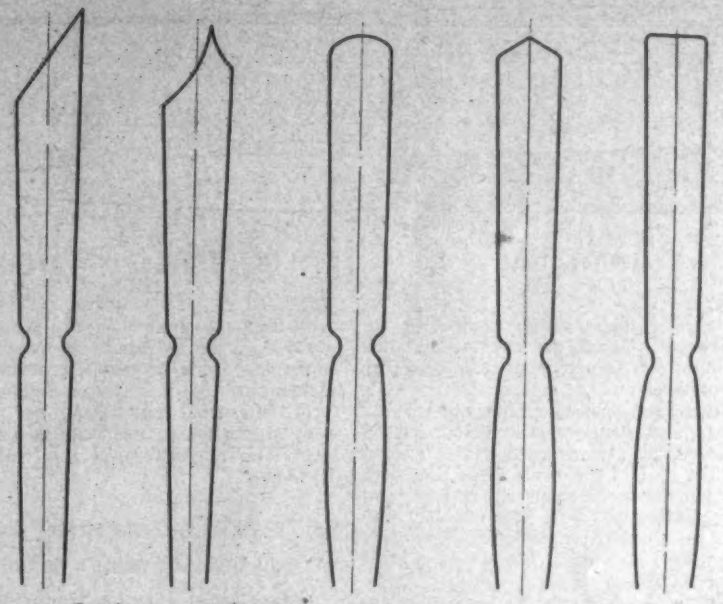


FIG. 1. SUGGESTIONS FOR HANDLES

and necessary body to the handle. These dimensions, however, are flexible, and may be altered as seen fit.

Begin the project by designing the full-sized pattern on paper, and having produced a well-balanced sketch, glue the pattern to the metal stock, as shown in Figure 2. This done, place the stock in a vise and proceed to cut the blank out with a hack saw. Use a 14-tooth saw in cutting the aluminum, because the rather large chips from this soft metal would clog a fine blade. Since this metal is easily marred, it is necessary to provide a sheet-metal shield for the jaws of the vise. This precaution saves much time, labor, and temper, especially in the final polishing procedure. In sawing the blank it would be wise to saw just slightly outside the pattern to allow a margin for filing to exact size. The letter opener is next reduced to exact pattern size with a file. See Figure 3. Use a smooth forward stroke, bearing in mind that a file cuts rather deeply in soft metals, and hence particular care should be exercised to retain the symmetry of the various lines. A round file is then used to produce the cutout fillet effect at the junction of the handle and the blade.

The blade is best shaped by clamping the handle part to the edge of a workbench with a C clamp, and then filing the excess material away until the desired effect is obtained. Constant reference to the cross section of the blade in Figure 4 would aid in shaping the blade properly. Keep in mind that the blade part of the letter opener must be smooth flowing, sharp and symmetrical on both sides. Naturally the handle, too, must present well-designed lines and must not in any way be uncomfortable in the hand. The end of the handle may be round, oval, diamond shaped, or simply squared across. Notice that there is a slight taper in the handle from the end to the blade.

Being satisfied that the handle and blade are well shaped, you can proceed to the polishing and decorating procedure. The polishing process consists of removing all traces of tool marks, scratches, and irregularities with successively finer and finer grades of emery cloth and then buffing to a mirrorlike luster. The recommended grades of emery cloth are: 100, 180, 240, 320, 400, followed by buffing,

FIG. 2. GLUE THE PATTERN ON THE STOCK AND PROCEED TO CUT OUT WITH A HACK SAW

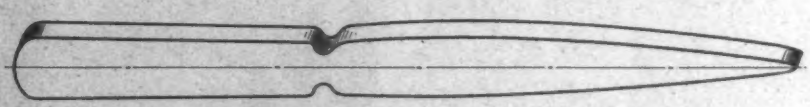


FIG. 3. FILE AND TRIM THE BLANK TO PATTERN SIZE

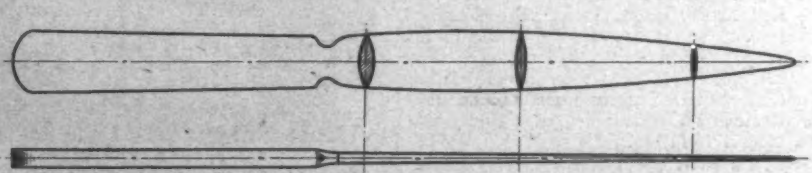


FIG. 4. SHAPE THE HANDLE AND BLADE AS SHOWN

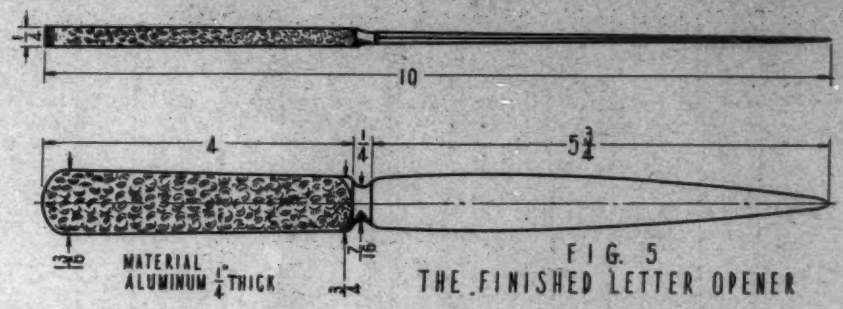


FIG. 5
THE FINISHED LETTER OPENER

using rouge as the polishing compound. Be sure, however, to rinse the letter opener with warm water and soap to remove all traces of emery particles prior to buffing.

A rather handy polishing technique consists of using ½-in. strips of emery cloth backed with masking tape in a shoeshine fashion across the oval of the blade. This procedure tends to preserve the shape of the blade and is very efficient as well. The masking tape backing is used to prevent the strips from tearing, thus lengthening the service of the strips.

The project is now well on its way to completion and the student should exercise the greatest care in the final polishing and decorating process. Prior to peening the handle, the letter opener is buffed. Then select a small ball-peen hammer, making sure it has a well-polished face and is free of nicks and mars. It might be wise to practice several blows on a piece of scrap before attempting the handle. Determine the weight of the blow, which will give the desired effect. The handle is then placed on an anvil, a piece of cardboard separating the handle from the face of the anvil. The cardboard serves as a buffer and protects the opposite side of the handle from nicks and mars during the peening process. Begin at one end of the handle and by means of systematic hammer blows, produce the desired decorative effect. Keep the blows fairly close to each other but try to avoid overlapping. When the two faces have been peened the sides and end may also be decorated or simply left plain. See Figure 5. The peening process completed, buff the letter opener once more to regain any lost luster during the peening, and the project is completed except for lacquering which is optional.

Material

1 piece, 24ST. aluminum, ¼ x ⅜ x 10⅛

Tools

Hack saw, file, round file, emery cloth of assorted grits, small ball-peen hammer, anvil, buffer, buffing compound, metal lacquer.

Procedure

1. Produce a suitable design for a letter opener.
2. Glue the full sized pattern on a piece of aluminum stock.
3. Cut out the blank with a hack saw, using a 14-tooth blade.
4. File the blank to exact pattern size.
5. Reduce the blade to the desired shape and size.
6. Shape the handle.
7. File out the fillet at the junction of the handle to the blade, using a small round file.
8. Remove all tool marks and irregularities with emery cloth.
9. Polish with fine grade of emery cloth, finishing with grit 400.
10. Buff the letter opener to a high luster.
11. Decorate the handle by peening. Prior to peening, check the condition of the hammer making sure that it is free of dents and mars.
12. After the handle has been peened it may be rebuffed to regain any lost luster.
13. The finished project may be lacquered if desired.

FLEXIBLE TEACHING AIDS

LT. (jg.) DONALD MALEY, U.S.N.R.
Educational Services Department
U. S. Naval Hospital
Chelsea, Mass.

The expanding programs of schools and shops have developed greater needs for more elastic teaching aids. It is wise to make teaching aids flexible enough to cover a number of related topics. The aids discussed herein may very well be adapted to such fields as house construction, carpentry, plumbing, house wiring, house planning, blueprint reading, and certain phases of architectural drawing.

The teaching aids consist of a model house built along conventional construction methods, a full-size floor plan covered with a transparent protective material, and a set of charts showing plumbing and house wiring symbols. The material and equipment necessary to make these objects may be found in most school shop setups.

The Model House

The model house is an accurate scale model built in accordance with good house construction practices. Windows and doors are to be framed, room partitions inserted, stairwell cut and framed, and stairs put in. It is not wise to cover the floor joists, or put siding on the house, as it tends to hide the construction features that are intended to be brought out. Only a partial covering of the roof is necessary, as there too it is important that the details of construction may be observed and pointed out. Before building the model house, it is wise to consult the local house and building codes to make certain that the model will conform to local regulations.

The wood used in the construction may be salvaged from wooden crates or boxes that would ordinarily be wasted. The house, as shown in Figure 1, has four rooms and a bath, with an unfinished second floor. The house measures 54 by 48 in. and is 41 in. high. This is only one method of house construction, and one type of house. In an expanded program, it would be wise to have several model houses using the various types of house construction.

The Floor Plan: The floor plan is a full size plan made in accordance with the model house it represents. It is drawn on heavy white drawing paper and mounted on a stiff backing of plywood. The drawing is then covered with a large sheet of Plexiglas or window glass, and framed to hold it in place. The transparent covering serves two purposes. It tends to keep the drawing clean, and also affords a surface upon which to write without marking up the drawing.

The Symbol Charts: The symbol charts are made of the standard house wiring and plumbing symbols as found in the handbooks, or in most drawing texts. The charts and symbols thereon are made large enough that they may be put up on the wall, and observed from any distance in the room.

Making Use of the Aids

Now that the foregoing description of the various aids has been given, making use of them is the next step. In the carpentry or house construction classes, the model house shows actual construction practices. The framing of the roof, construction of dormers, windows, and doors can be easily demonstrated. The student can see how the joists, rafters, and supporting members are cut and fastened to their adjoining parts.

In classes for house wiring and plumbing, the combination of the model house, the floor plan, and the charts is used. The first step is to plan the wiring or plumbing and this is done on the floor plan. Since the plan is cov-

Fig. 1. Floor plan, electrical symbols, and model house in typical classroom setup

ered with a transparent protective material, the instructor or pupil may use a black crayon and write directly on the plan without doing permanent injury. The charts are consulted for the proper symbol, and this symbol is put in the plan at the place desired. This operation accomplishes two objectives. It gives the student actual planning practice, and at the same time acquaints him with the correct symbol to use. It is possible to put in the entire wiring plan for the first floor of the house. At the same time, the instructor should endeavor to show the students the best and most practical wiring or plumbing of the house. The marks that have been put on the plan with the crayon may be easily erased with an ordinary cloth.

In regard to house planning, the combination of the house and floor plan has numerous educational possibilities. Model furniture can be made and placed in accordance with the student's planning. Also, in this respect, the huge floor plan can be laid flat, and the furniture placed thereon. Changes and alterations in the physical features of the house can be discussed and marked on the plan without doing injury to the drawing.

It is much easier to teach a subject when you have at hand all the objects involved in the lesson. For instance, in teaching blueprint reading with the use of these aids, the pupil can much more easily visualize the floor plan when the actual house is next to it. This is a more positive approach to teaching.

These are but a few of the many uses these items may fulfill in the shop or academic classroom. If the instructor has the time and materials, the house may be wired for lighting, using miniature sockets, and flashlight bulbs. If the wiring is put in, it too should be done along actual wiring practices, and conform as much as possible to house wiring standards already set up.

DE LUXE TUBE TESTER

JAMES W. HOSKINS

Authorized Radiotrician and Teletrician

Palo Alto, Calif.

The de luxe tube tester, shown in Figure 1, is the result of extensive experimentation. It is of the emission type, and about 400 types of tubes may be tested with it. Provisions have been made for additions to handle any new tubes as they are released. Thus, the tester will not be *outdated* for some time. The meter may be used as a volt-ohm milliammeter for d.c. voltages and currents. The basic circuit for the short test is shown in Figure 2.

Fig. 1. Panel view of the de luxe tube tester

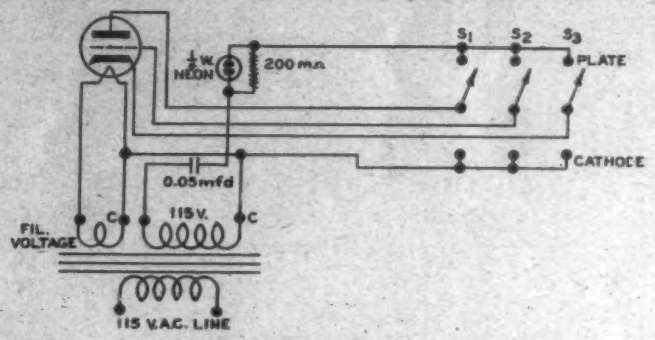


Fig. 2. Basic circuit for the short test

By putting S_3 in the plate position it is possible to determine if there is a short between the cathode. By setting S_3 to the cathode position and S_2 in plate position the neon will show a short between the grid position and cathode. By manipulating these switches in this manner, it is possible to determine if there is a short between any two elements.

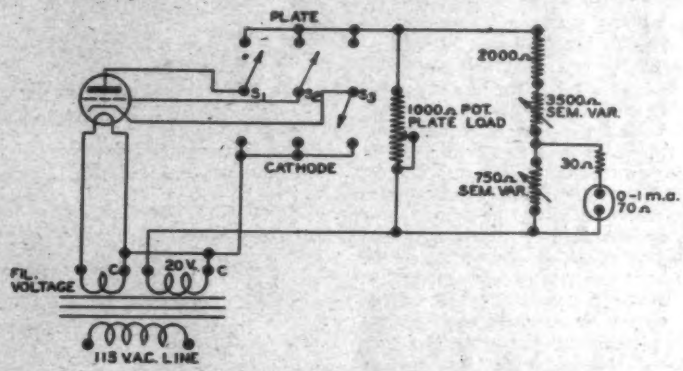


Fig. 3. Connections for making a quality test

The quality test of the same tube (as shown in the short test) would be set up as follows:

By setting S_1 and S_3 in the plate position and S_2 in the cathode position, and adjusting the plate load to the proper value, the 0-1Ma. meter will indicate if the tube is good. Any value over 0.56 Ma. is good for most tubes. Any value over 0.2 Ma. is good for the diode sections of all Duplex Diode Triode Tubes. (i.e. 6Q7, 75, 7C6, etc.) From the foregoing a better understanding of the diagram of the de luxe tube tester shown in Figure 4 may be obtained.

Before starting the panel layout and construction of this project it is suggested that the student study all of the illustrations and diagrams carefully. It is necessary to understand this project before any work is started. The case was constructed of ⅜-in. mahogany. It is finished with a good grade of clear lacquer. The case is 15 in. long, 10½ in. wide, by 6 in. high, with the cover on. The cover is hinged with two loose joint hinges so it can be removed when not in use. The cover is 2 in. deep. All of the foregoing dimensions are outside measurements. There is a small compartment at the left end of the panel for tools and test leads. The panel is 11¾ in. long by 9¾ in. wide, and it is made of ⅛-in. tempered Presdwood. There is a ⅜ by 1-in. strip around the inside of the case, and a partition under the left end to support the panel.

The panel is drilled to suit the parts available. After the panel is drilled and sanded smooth around all holes, it is given two coats of white shellac, then rubbed with fine steel wool until very smooth. The panel is next given a coat of spar varnish after which it again is rubbed with fine steel wool. The student must be careful that no particles of steel wool or dust are on the panel when these finishing coats are applied. At this time the decals may be put on, or the lettering may be put on the panel with white enamel. After this is completed a final coat of spar varnish is applied and allowed to dry in a dust free place for at least 48 hours, if not longer.

In the original model, the author used amphenol type R S sockets. The seven-prong combination socket is catalog No. RS7-CD and has provision for testing all types of panel lamps. The RCA miniature socket is catalog No. 78A-7P with a No. 4 retainer ring and mounting place. The spare socket is a blank, catalog No. 78B, and is mounted in the same manner as the RCA socket is mounted.

The four selector switches are centralab, nonshorting type selector switches. The four deck (S4A, S4B, S4C, S4D) switch is disassembled and the 1-in. spacers are replaced with ½-in. spacers and reassembled. The sockets and the centralab lever action switches (catalog No. 1454) are mounted on the panel and wired as shown in Figure 4. All of the contacts on the sockets and switches that are filament terminals are wired with No. 18

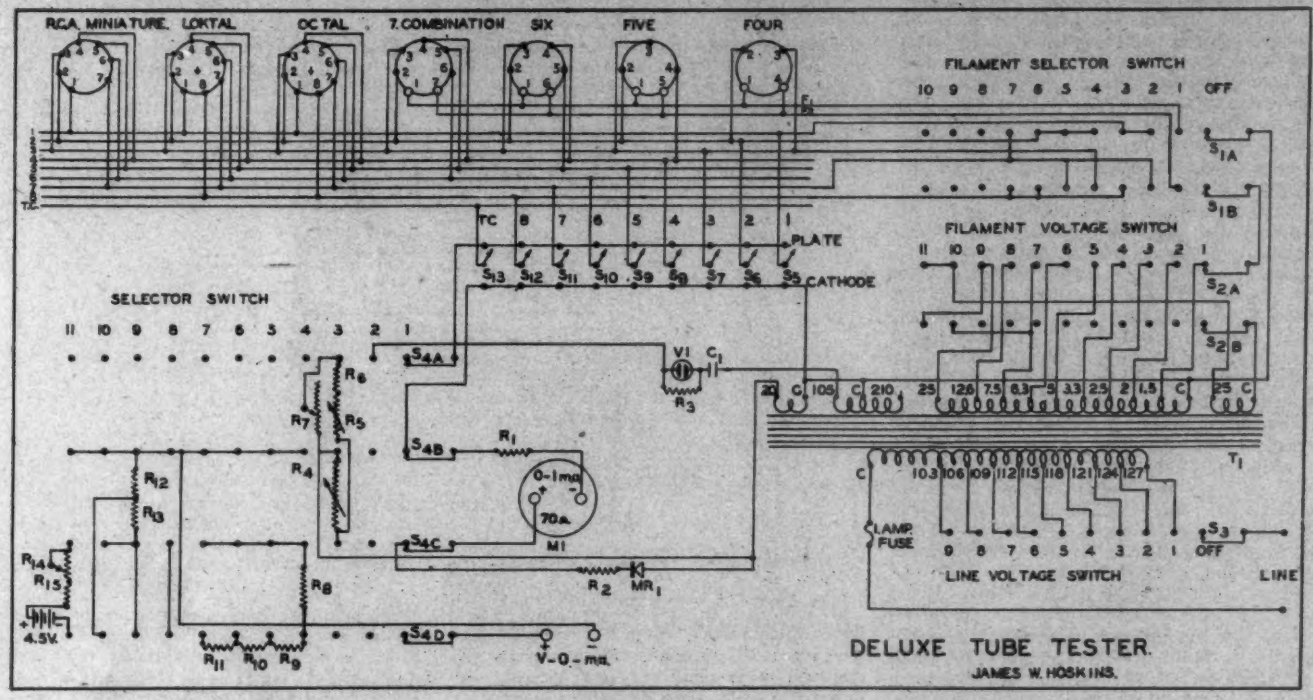


Fig. 4

hook-up wire. The remaining contacts are wired with No. 20 hook-up wire. Whenever possible the wiring is cabled and sewed or tied with No. 3 linen cord. This is done so as to keep the wiring as compact as possible. The filament selector switch is installed and wired as shown in Figure 4 and Figure 5. The line voltage switch and filament voltage switch are wired to the filament transformer before they are installed on the panel. After these parts are installed the leads from the filament selector switch are connected to the transformer and filament voltage switch.

The milliammeter shunts and the voltage multiplier resistors are mounted on the selector switch as shown in Figure 4. The four rotor leads and the remaining leads are cut about 12 in. long. This is then mounted on the panel and is connected into the circuit.

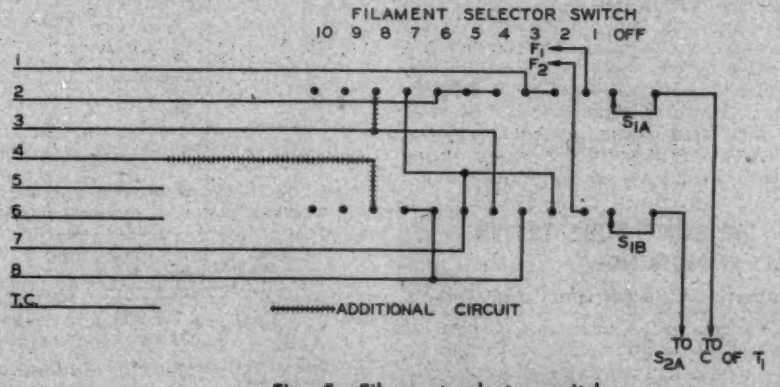
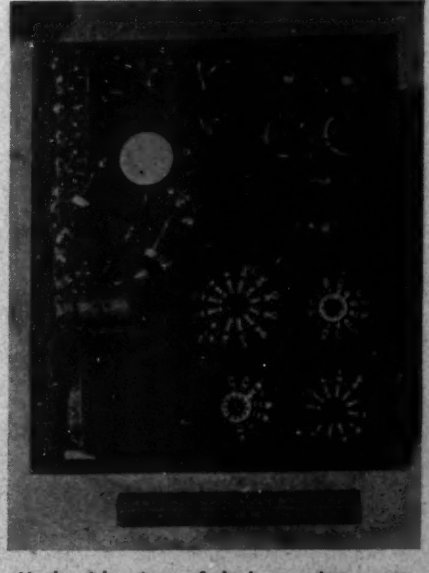


Fig. 5. Filament selector switch



Underside view of de luxe tube tester

The ohms zero adjust (R14) is mounted on a bracket supported by one of the bolts on the 71-1 combination socket and the mounting plate for the key switches (S_8 to S_{35} inclusive). This control also mounts a piece of fiber large enough to mount the following parts: R_4, R_5, R_6, R_{12}, R_{13}, MR_1, and a terminal strip for the leads from the various controls. See Figure 4.

The meter is opened and the scale is replaced with a volt-ohm milliammeter scale. See sample scale shown in Figure 6. The scale is shaded red from 0 to 0.4 Ma. and is lettered *bad*. A line is drawn at 0.5 Ma. and a letter *L* is drawn under the line. This is for the line voltage checker. The scale is shaded green from 0.56 to 1.0 Ma. and is lettered *good*. When this is done the meter is reassembled and mounted on the panel. R_1 is mounted directly to the negative terminal. This resistor brings the meter resistance up to 100 ohms. In the original model the meter had an internal resistance of 70 ohms. If a 33-ohm meter is used, R_1 should be 17 ohms. If a 50-ohm or 100-ohm meter is used, R_1 is omitted. Using a meter with either of these internal resistances makes it easier to figure the milliammeter shunts. For those wishing to make their own shunts, Ohmite 10-watt semi-variable resistors may be used.

When the wiring is completed, check it for shorts and other defects. If possible have someone else check it, so as to be sure there are no mistakes.

Since the original model was completed, a new series of miniature button tubes had the filament connected to pins No. 1 and No. 7. This means an additional position on the filament selector switch. See Figure 5 for the additional wiring. It is shown as a crosshatched line.

The filament transformer used in the original model was removed from an old tester. A filament transformer can be purchased from Stancor (Cat. No. P-1834-3) or Thermador (Cat. No. J.30A). If either of these transformers are used they will have to be taken apart and have an additional 20-volt, 50-Ma. coil wound before they can be used.

When one of these transformers is used the filament voltage switch may be changed as shown in Figure 7. For those who have the facilities to wind their own filament transformer, Figure 8 gives the necessary data.

Before the tube tester can be used it is necessary to make two simple adjustments as follows:

1. Place a new 01A in the tester, set all controls for testing this tube and adjust R_4 (750 ohm 10 watt sem. var.) until the meter reads 85.

2. Place a new 25Z5 or 25Z6 in the tester. Set all controls for testing this tube. Adjust R_5 (3500 ohm sem. var.) until the meter reads 90 with both diodes connected in parallel. When these two adjustments are made, the unit is ready to test any of the tubes listed in the tube chart.

To use the meter as a volt-ohm milliammeter, plug the leads into the two banana jacks and proceed as outlined in the instructions.

This project is the most advanced of any we have presented for student use as well as the hobby seeker of the city library. If the construction is done carefully and well

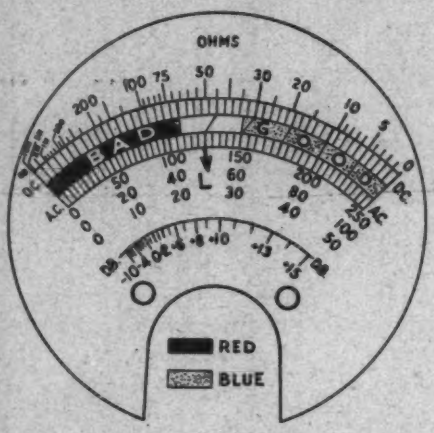


Fig. 6. Sample meter scale, full size for 3-in. meters

checked, there is no reason that all of the testers made from these plans should not work as well as the model from which the plans were made. At this time the materials for this unit will cost approximately $35 if the case is made by the builder.

OPERATING INSTRUCTIONS FOR DE LUXE TUBE TESTER

Tube Testing:

1. Place tube in proper socket and put the grid cap lead on if required.

2. Set the *filament voltage switch* S_2 to the proper position for the tube under test. The voltages available are:

1. 1.5	5. 5	9. 25
2. 2	6. 6.3	10. 32.5
3. 2.5	7. 7.5	11. 50
4. 3.3	8. 12.6	

3. Set the *filament selector switch* (S_1) to the position shown in the chart for the tube under test.

4. Connect the tester to the line, set the *selector switch* (S_4) on position one, and adjust the *line voltage switch* (S_5) until the meter reads LV. See sample meter scale in Figure 6.

5. Set the *selector switch* to position two and by moving the *plate-cathode switches* (S_8 to S_{12}) from plate to cathode position omitting the filament pins on the tube. Under test the neon lamp (V_1) will glow when there is a short between any two elements in the tube.

6. Set the *plate-cathode switches* (S_8 to S_{12}) and the *plate load* (R_7) to the proper value as shown in the chart for the tube under test. Set the *selector switch* (S_4) to position three. The meter will indicate if the tube is good or bad. See sample meter scale in Figure 6.

To Use the Tester as a Volt-Ohm Milliammeter:

Set the *selector switch* (S_4) to the following positions for the ranges indicated:

Position	*Range*
4	0– 10 v. d.c.
5	0– 50 v. d.c.
6	0–250 v. d.c.
7	0–500 v. d.c.
8	0– 1 Ma. d.c.
9	0– 10 Ma. d.c.
10	0–100 Ma. d.c.
11	0–1 meg r (RX100), short the test leads and adjust R_{16} until the meter reads zero ohms

LIST OF PARTS FOR DE LUXE TUBE TESTER

R_1 30 R W.W.*
R_2 10 MR ½W.*
R_3 200 MR ½W.
R_4 750 R 10W. Semivariable
R_5 3500 R 10W. Semivariable
R_6 2000 R 1W.
R_7 1000 R W. W. Pot.
R_8 9900 R1 W. ± 1%
R_9 40000 R 1W. ± 1%
R_{10} 200000 1W. ± 1%
R_{11} 250000 R 1W. ± 1%
R_{12} } Ma. shunts (10 Ma. and
R_{13} } 100 Ma.)
R_{14} 3000 RW W. Pot.
R_{15} 2000 R 1W.
S_{1a}, S_{1b}, — 2 pole — 11 positions, N.S., rotary sw.
S_{2a}, S_{2b} — 2 pole — 11 positions, N.S., rotary sw.
S_3 — single pole — 11 positions, N.S., rotary sw.
S_{4a}, S_{4b}, S_{4c}, S_{4d} — 4 pole — 11 positions, N.S., rotary sw.
S_5 through S_{12} single pole, 3 positions, key sw.
T_1 — special fil. trans.
C_1 — 0.05 mfd. 600 v. paper cond.
V_1 — ¼ W. Neon
MR_1 — ½ wave meter rectifier
Miscellaneous:
1 — 4.5 v. C Battery
1 — 1 Amp. 3AG fuse and holder
1 — Line cord and plug
2 — 1 to 11 sw. plate
2 — off 1 to 9 sw. plate
1 — 0 to 1 00 vol. cont. plate
5 — Bar knobs
1 — Small round knob
1 — Each of the following amphenol sockets:
4 prong, octal,
5 prong, loctal,
6 prong, RCA Miniature,
7c prong
Wire — 25' No. 18 Hook-up
50' No. 20 Hook-up

*Calibrate to meter used. R = ohms.

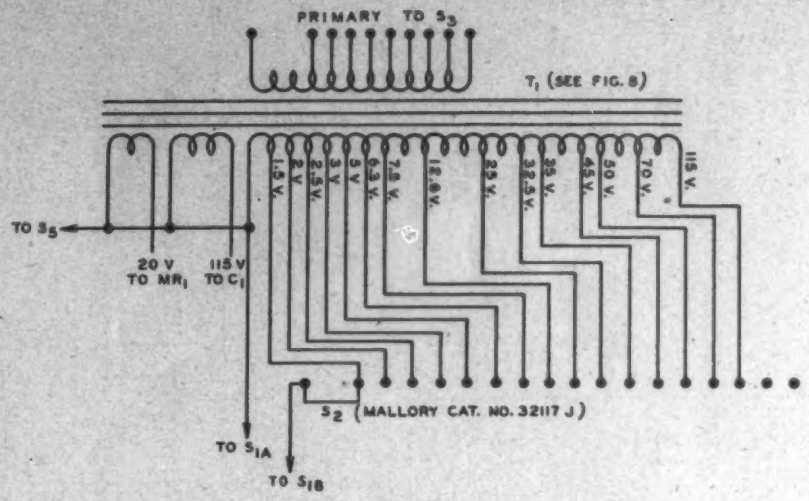
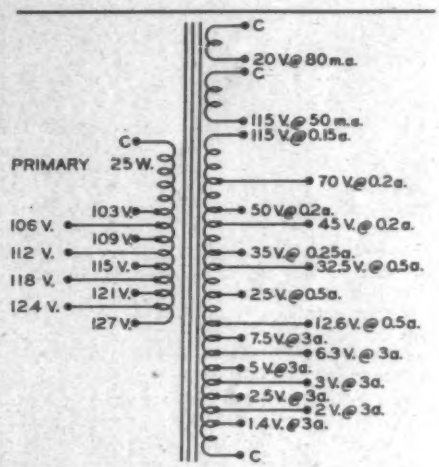


Fig. 7



SECTION OF CORE (INCHES) ¾ X 1
AREA OF CORE (SQUARE INCHES) 0.75
PRIMARY TURNS - 1270, TAPPED AT THE 1030, 1060, 1090, 1120, 1150, 1180, 1210, AND 1240 TURNS
PRIMARY WIRE SIZE - 27
SECONDARY TURNS -
20 V. COIL - 200 TURNS NO. 30 WIRE
115 V. COIL - 1150 TURNS NO. 32 WIRE
FILAMENT COIL - 10 TURNS PER VOLT
(SEE WIRE TABLE FOR WIRE SIZE)

Fig. 8. Winding data for T_1

CHART SHOWING DATA ON TUBES

RECEIVING TYPES WITH 4, 5, 6, AND 7 PIN BASES

Tube type	*Filament voltage*	*Filament selector sw.*	*Plate load*	*Key switches* Cathode	Plate
01A	5	1	72	..	2,3
1A4–P	2	1	65	..	2,3, TC
1A6	2	1	70	..	2,3,4,5, TC
1B4–P	2	1	74	..	2,3
1B5/25S	2	1	62	..	2,3,4,5
1C6	2	1	62	..	2,3,4,5, TC
1F4	2	1	54	..	2,3,4
1F6	2	1	64	..	2,3,4
2A3	3	1	28	..	2,3
2A5	3	1	42	5	2,3,4
2A6	3	1	36	5	2, TC
	3	1	52*	5	3
	3	1	52*	5	4

*NOTE: Any value over 20 on the zero to 100 scale is good.

Tube type	Filament voltage	Filament selector sw.	Plate load	Key switches: Cathode	Key switches: Plate
2A7	3	1	42	6	2, 3, 4, 5, TC
2B7	3	1	54	6	2, 3, TC
	3	1	52*	6	4
	3	1	52*	6	5
2E5	3	1	85	5	2, 3, 4
5Z3	5	1	38	..	2
	5	1	38	..	3
6A3	6	1	34	..	2, 3
6A4/LA	6	1	56	..	2, 3, 4
6A6	6	1	32	4	2, 3
	6	1	32	4	5, 6
6A7	6	1	42	6	2, 3, 4, 5, TC
6AB5/6N5	6	1	80	5	2, 3, 4

RECEIVING TYPES WITH 4, 5, 6, AND 7 PIN BASES

6B5	6	1	58	5	2, 3, 4
6B7	6	1	54	6	2, 3, TC
	6	1	52*	6	4
	6	1	52*	6	5
6C6	6	1	44	5	2, 3, 4, TC
6C7	6	1	40	6	2, TC
	6	1	52*	6	4
	6	1	52*	6	5
6D6	6	1	44	5	2, 3, 4, TC
6D7	6	1	44	6	2, 3, 4, TC
6E5	6	1	85	5	2, 3, 4
6E6	6	1	52	4	2, 3
	6	1	52	4	5, 6
6E7	6	1	44	6	2, 3, 4, TC
6F7	6	1	43	6	3, TC
	6	1	52	6	4, 5
6T5	6	1	90	5	2, 3, 4
6U5/6G5	6	1	80	5	2, 3, 4
6Y5	6	1	30	4	3
	6	1	30	4	5
6Z3/1V	6	1	28	3	2
6Z4/84	6	1	30	4	2
	6	1	30	4	3
10	7	1	70	..	2, 3
12A5	8	1	30	5	2, 3, 4
12A7	8	1	38	6	2, 3, TC
	8	1	30	4	5
12Z3	8	1	22	3	2
15	2	1	70	4	2, 3, TC
19	2	1	55	..	2, 3
	2	1	55	..	4, 5
20	4	1	85	..	2, 3

RECEIVING TYPES WITH 4, 5, 6, AND 7 PIN BASES

22	4	1	75	..	2, 3
24	3	1	50	4	2, 3, TC
25Y5	9	1	22	3	2
	9	1	22	4	5
25Z5	9	1	28	3	2
	9	1	28	4	5
26	1	1	66	..	2, 3
27	3	1	45	4	2, 3
30	2	1	68	..	2, 3
31	2	1	70	..	2, 3
32	2	1	70	..	2, 3, TC
33	2	1	56	..	2, 3, 4
34	2	1	70	..	2, 3, TC
35/51	3	1	45	4	2, 3, TC
36	6	1	42	4	2, 3, TC
37	6	1	48	4	2, 3
38	6	1	42	4	2, 3, TC
39/44	4	1	50	4	2, 3, TC
40	5	1	70	..	2, 3
41	6	1	42	5	2, 3, 4
42	6	1	38	5	2, 3, 4
43	9	1	30	5	2, 3, 4
45	3	1	52	..	2, 3
46	3	1	50	..	2, 3, 4
47	3	1	50	..	2, 3, 4
48	9	1	28	5	2, 3, 4
49	2	1	62	..	2, 3, 4

Tube type	Filament voltage	Filament selector sw.	Plate load	Key switches: Cathode	Key switches: Plate
RECEIVING TYPES WITH 4, 5, 6, AND 7 PIN BASES					
50	7	1	66	..	2, 3
53	3	1	32	4	2, 3
	3	1	32	4	5, 6
55	3	1	42	5	2, TC
	3	1	52*	5	3
	3	1	52*	5	4
56	3	1	46	4	2, 3
57	3	1	42	5	2, 3, 4, TC
58	3	1	44	5	2, 3, 4, TC
59	3	1	42	6	2, 3, 4, 5
71A	5	1	54	..	2, 3
75	6	1	36	5	2, TC
	6	1	52*	5	3
	6	1	52*	5	4
76	6	1	44	4	2, 3
77	6	1	42	5	2, 3, 4, TC
78	6	1	44	5	2, 3, 4, TC
79	6	1	24	4	2, 3
	6	1	24	4	5, TC
80	5	1	85	..	2
	5	1	85	..	3
81	7	1	82	..	2
82	3	1	40	..	2
	3	1	40	..	3
83	5	1	35	..	2
	5	1	35	..	3
83V	5	1	45	..	2
	5	1	45	..	3
85	6	1	42	5	2, TC
	6	1	52*	5	3
	6	1	52*	5	4
89	6	1	42	5	2, 3, 4, TC
X99	4	1	100	..	2, 3
RECEIVING TYPES WITH OCTAL BASES					
1A5Gt/G	1	5	70	..	3, 4, 5
1A7Gt/G	1	5	80	..	3, 4, 5, 6, TC
1B7Gt/G	1	5	80	..	3, 4, 5, 6, TC
1C5Gt/G	1	5	50	..	3, 4, 5
1C7G	2	5	62	..	3, 4, 5, 6, TC
1C5Gt/GP	2	5	65	..	3, 4, 5, TC
1D7G	2	5	70	..	3, 4, 5, 6, TC
1D8Gt	1	5	65	..	3, 4, 5
	1	5	68	..	6, TC
	1	5	52*	..	8
1E5G	1	5	68	..	3, 5
1E5GP	2	5	74	..	3, 4, TC
1E7G	2	5	35	..	3, 4, 8
	2	5	35	..	5, 6, 8
1F5G	2	5	54	..	3, 4, 5
1F7G	2	5	64	..	3, 4, 5, 6, TC
1G4Gt/G	1	5	68	..	3, 5
1G5G	2	5	60	..	3, 4, 5
1G6Gt/G	1	5	55	..	3, 4
1H4G	2	5	68	..	3, 5
1H5Gt/G	1	5	80	..	3, 5, TC
1H6G	2	5	62	..	3, 4, 5, 6
1J5G	2	5	60	..	3, 4, 5
1J6G	2	5	55	..	3, 4
	2	5	55	..	5, 6
1N5Gt/G	1	5	80	..	3, 4, TC
1N6G	1	5	65	..	3, 4, 5, 6
RECEIVING TYPES WITH OCTAL BASES					
1P5Gt/G	1	5	65	..	3, 4, TC
1Q5Gt/G	1	5	50	..	3, 4, 5
1Q5Gt/G	1	5	50	..	3, 4, 5
1T5Gt	1	5	50	..	3, 4, 5
3A8Gt/G	3	5	80	..	3, 4, TC
	3	5	68	..	5, 6
	3	5	52*	..	8
3Q5Gt/G	3	5	50	..	3, 4, 5
4A6G	4	5	55	..	3, 4
	4	5	55	..	5, 6
5T4	5	6	38	..	4
	5	6	38	..	6
5U4	5	6	38	..	4
	5	6	38	..	6

Tube type	Filament voltage	Filament selector sw.	Plate load	Key switches: Cathode	Key switches: Plate
5V4	5	6	45	..	4
	5	6	45	..	6
5W4	5	6	65	..	4
	5	6	65	..	6
5Y3	5	6	70	..	4
	5	6	70	..	6
5Y4	5	7	70	..	3
	5	7	70	..	5
5Z4	5	6	45	..	4
	5	6	45	..	6
6A8	6	5	42	8	3, 4, 5, 6, TC
6AB7/1853	6	5	28	5	3, 4, 6, 8
6AC5Gt/G	6	5	50	8	3, 5
6AC7/1852	6	5	22	5	3, 4, 6, 8
6AD5	6	5	40	8	3, 5
RECEIVING TYPES WITH OCTAL BASES					
6AD7	6	5	46	8	3, 4, 5
	6	5	46	8	1, 6
6AE5	6	5	48	8	3, 5
6AF5	6	5	45	8	3, 5
6AG7	6	5	22	5	1, 4, 6, 8
6AH7	6	7	32	2	1, 3
	6	7	32	4	5, 6
6B4	6	5	30	..	3, 5
6B6	6	5	36	8	3, TC
	6	5	52*	8	4
	6	5	52*	8	5
6B8	6	5	54	8	3, 6, TC
	6	5	52*	8	4
	6	5	52*	8	5
6C5	6	5	46	8	3, 5
6C8	6	5	35	4	3, TC
	6	5	35	8	5, 6
6D8	6	5	52	8	3, 4, 5, 6, TC
6F5	6	5	35	8	4, TC
6F6	6	5	46	8	3, 4, 5
6F8	6	5	35	4	3, TC
	6	5	35	8	5, 6
6G6	6	5	45	8	3, 4, 5
6H4	6	5	40	8	4
6H6	6	5	40	4	3
	6	5	40	8	5
6J5	6	5	30	8	3, 5
6J7	6	5	38	8	3, 4, 5, TC
6J8	6	5	50	8	5, 6
	6	5	50	8	3, 4, TC
6K5	6	5	40	8	3, TC
RECEIVING TYPES WITH OCTAL BASES					
6K6	6	5	54	8	3, 4, 5
6K7	6	5	42	8	3, 4, 5, TC
6K8	6	5	28	8	3, 4, 5, 6, TC
6L5	6	5	48	8	3, 5
6L6	6	5	28	8	3, 4, 5
6L7	6	5	32	8	3, 4, 5, TC
6N6	6	5	60	8	3, 4, 5
6N7	6	5	32	8	3, 4
	6	5	32	8	5, 6
6P5	6	5	45	8	3, 5
6P7	6	4	48	8	4, 5, TC
	6	4	52	8	6, 7
6Q7	6	5	36	8	3, TC
	6	5	52*	8	4
	6	5	52*	8	5
6R7	6	5	26	8	3, TC
	6	5	52*	8	4
	6	5	52*	8	5
6S7	6	5	48	8	3, 4, 5, TC
6SA7	6	5	28	1, 6	3, 4, 5, 8
6SC7	6	7	32	6	2, 3
	6	7	32	6	4, 5
6SD7	6	5	24	5	3, 4, 6, 8
6SF5	6	7	40	2	3, 5
6SF7	6	7	38	3	2, 4, 6
	6	7	52*	3	5
6SG7	6	5	22	3, 5	4, 6, 8
6SH7	6	5	22	3, 5	4, 6, 8
6SJ7	6	5	38	5	3, 4, 6, 8

*NOTE: Any value over 20 on the zero to 100 scale is good.

Tube type	Filament voltage	Filament selector sw.	Plate load	Key switches: Cathode	Key switches: Plate
RECEIVING TYPES WITH OCTAL BASES					
6SK7	6	5	42	5	3, 4, 6, 8
6SL7	6	7	32	3	1, 2
	6	7	32	6	4, 5
6SN7	6	7	32	3	1, 2
	6	7	32	6	4, 5
6SQ7	6	7	36	3	2, 6
	6	7	52*	3	4
	6	7	52*	3	5
6SR7	6	7	38	3	2, 6
	6	7	52*	3	4
	6	7	52*	3	5
6SS7	6	5	42	5	3, 4, 6, 8
6ST7	6	7	38	3	2, 6
	6	7	52*	3	4
	6	7	52*	3	5
6T7	6	5	36	8	3, TC
	6	5	52*	8	4
	6	5	52*	8	5
6U6	6	5	30	8	3, 4, 5
6U7	6	5	40	8	3, 4, 5, TC
6V6	6	5	32	8	3, 4, 5
6V7	6	5	46	8	3, TC
	6	5	52*	8	4
	6	5	52*	8	5
6W5	6	5	30	8	3
	6	5	30	8	5
6W7	6	5	42	8	3, 4, 5, TC
6X5	6	5	30	8	3
	6	5	30	8	5
6Y6	6	5	30	8	3, 4, 5
6Y7	6	5	34	8	3, 4
	6	5	34	8	5, 6
RECEIVING TYPES WITH OCTAL BASES					
6Z7	6	5	32	8	3, 4
6ZY5	6	5	32	8	3
	6	5	32	8	5
12A6	8	5	24	8	3, 4, 5
12A8	8	5	42	8	3, 4, 5, 6, TC
12AH7	8	7	32	2	1, 3
	8	7	32	4	5, 6
12B8	8	5	42	1	3, 4, TC
	8	5	40	6	5, 8
12C8	8	5	54	8	3, 6, TC
	8	5	52*	8	4
	8	5	52*	8	5
12F5	8	5	35	8	4, TC
12H6	8	5	40	4	3
	8	5	40	8	5
12J5	8	5	30	8	3, 5
12J7	8	5	38	8	3, 4, 5, TC
12K7	8	5	42	8	3, 4, 5, TC
12K8	8	5	28	8	3, 4, 5, 6, TC
12Q7	8	5	36	8	3, TC
	8	5	52*	8	4
	8	5	52*	8	5
12SA7	8	5	28	1, 6	3, 4, 5, 8
12SC7	8	7	32	6	2, 3
	8	7	32	6	4, 5
12SF5	8	7	40	2	3, 5
12SF7	8	7	38	3	2, 4, 6
	8	7	52*	3	5
12SG7	8	5	22	3, 5	4, 5, 8
12SH7	8	5	22	3, 5	4, 6, 8
RECEIVING TYPES WITH OCTAL BASES					
12SJ7	8	5	38	5	3, 4, 6, 8
12SK7	8	5	42	5	3, 4, 6, 8
12SL7	8	7	32	3	1, 2
	8	7	32	6	4, 5
12SN7	8	7	32	3	1, 2
	8	7	32	6	4, 5
12SQ7	8	7	36	3	2, 6
	8	7	52*	3	4
	8	7	52*	3	5
12SR7	8	7	38	3	2, 6
	8	7	52*	3	4
	8	7	52*	3	5
25A6	9	5	30	8	3, 4, 5
25A7	9	5	30	8	3, 4, 5
	9	5	28	1	6
25AC5	9	5	22	8	3, 5
25B6	9	5	26	8	3, 4, 5
25B8	9	5	42	1	3, 4, TC
	9	5	40	6	5, 8
25C6	9	5	24	8	3, 4, 5
25D8	9	5	38	1	3, 4, TC
	9	5	35	1	5, 6
	9	5	52*	1	8
25L6	9	5	24	8	3, 4, 5
25Z6	9	5	22	4	3
	9	5	22	8	5
32L7	10	5	24	8	3, 4, 5
	10	5	22	1	6
35L6	10	5	24	8	3, 4, 5
35Z4	10	5	22	8	5
35Z5	10	5	22	8	5
45Z5	10	5	28	8	5
RECEIVING TYPES WITH OCTAL BASES					
50L5	11	5	24	8	3, 4, 5
50Y6	11	5	28	4	3
	11	5	28	8	5
50Z7	11	5	28	4	3
	11	5	28	8	5
RECEIVING TYPES WITH LOCK-IN BASES					
1LA4	1	3	70	..	2, 3, 6
1LA6	1	3	80	..	2, 3, 4, 5, 6
1LB4	1	3	50	..	2, 3, 6
1LC5	1	3	80	..	2, 3, 4, 6
1LC6	1	3	80	..	2, 3, 4, 5, 6
1LD5	1	3	65	..	2, 3, 4, 6
1LE3	1	3	65	..	2, 6
1LH4	1	3	80	..	2, 4, 6
1LN5	1	3	80	..	2, 3, 4, 6
7A4	6	3	30	7	2, 6
7A5	6	3	30	7	2, 3, 6
7A6	6	3	40	2	3
	6	3	40	7	6
7A7	6	3	42	7	2, 3, 4, 6
7A8	6	3	42	7	2, 3, 4, 5, 6
7B4	6	3	35	7	2, 6
7B5	6	3	54	7	2, 3, 6
7B6	6	3	36	7	2, 3
	6	3	52*	7	5
	6	3	52*	7	6
7B7	6	3	42	7	2, 3, 4, 6
7B8	6	3	42	7	2, 3, 4, 5, 6
7C5	6	3	54	7	2, 3, 6
7C6	6	3	36	7	2, 3
	6	3	52*	7	5
	6	3	52*	7	6
7C7	6	3	38	7	2, 3, 4, 6
RECEIVING TYPES WITH LOCK-IN BASES					
7E6	6	3	38	7	2, 3
	6	3	52*	7	5
	6	3	52*	7	6
7E7	6	3	54	7	2, 5, 6
	6	3	52*	7	3
	6	3	52*	7	4
7F7	6	3	34	2	3, 4
	6	3	34	7	5, 6
7G7/1232	6	3	22	7	2, 3, 4, 6
7H7	6	3	22	7	2, 3, 4, 6
7J7	6	3	42	7	2, 3, 4, 5, 6
7L7	6	3	22	7	2, 3, 4, 6
7N7	6	3	32	2	3, 4
	6	3	32	7	5, 6
7Q7	6	3	28	7	2, 3, 4, 5, 6
7R7	6	3	54	7	2, 5, 6
	6	3	52*	7	3
	6	3	52*	7	4
7S7	6	3	42	7	2, 3, 4, 5, 6
7V7	6	3	28	7	2, 3, 4, 6
7W7	6	3	28	7	2, 3, 5, 6
7Y4	6	3	30	7	3
	6	3	30	7	6
7Z4	6	3	30	7	3
	6	3	30	7	6
14A4	8	3	30	7	2, 6
14A5	8	3	30	7	2, 3, 6
14A7/1287	8	3	42	7	2, 3, 4, 6
14B6	8	3	36	7	2, 3
	8	3	52*	7	5
	8	3	52*	7	6
RECEIVING TYPES WITH LOCK-IN BASES					
14B8	8	3	42	7	2, 3, 4, 5, 6
14C5	8	3	54	7	2, 3, 6
14C7	8	3	38	7	2, 3, 4, 6
14E6	8	3	38	7	2, 3
	8	3	52*	7	5
	8	3	52*	7	6
14F7	8	3	34	2	3, 4
	8	3	34	7	5, 6
14H7	8	3	22	7	2, 3, 4, 6
14J7	8	3	42	7	2, 3, 4, 5, 6
14N7	8	3	32	2	3, 4
	8	3	32	7	5, 6
14Q7	8	3	28	7	2, 3, 4, 5, 6
14R7	8	3	54	7	2, 5, 6
	8	3	52*	7	3
	8	3	52*	7	4
14S7	8	3	42	7	2, 3, 4, 5, 6
14W7	8	3	28	7	2, 3, 5, 6
14Y4	8	3	30	7	3
	8	3	30	7	6
28D7	9	3	24	6	2, 3, 4
	9	3	24	6	3, 5, 7
28Z5	9	3	22	7	3
	9	3	22	7	6
35A5	10	3	24	7	2, 3, 6
35Y4	10	3	22	7	2
35Z3	10	3	22	7	2
50A5	11	3	24	7	2, 3, 6
RECEIVING TYPES WITH MINIATURE BUTTON BASES					
1A3	1	2	40	3	2, 6
1L4	1	2	65	..	2, 3, 6
1R5	1	2	80	..	2, 3, 4, 6
1S4	1	2	50	..	2, 3, 4, 6
1S5	1	2	65	..	3, 4, 5, 6
1T4	1	2	65	..	2, 3, 6
3A4	4	2	50	..	2, 3, 4, 6
3A5	4	2	68	..	2, 3
	4	2	68	..	5, 6
3Q4	4	2	50	..	2, 3, 4, 6
3S4	4	2	50	..	2, 3, 4, 6
6AG5	6	8	42	2, 7	1, 5, 6
6AJ5	6	8	42	2, 7	1, 5, 6
6AK5	6	8	42	2, 7	1, 5, 6
6AK6	6	8	45	7	1, 2, 5, 6
6AL5	6	8	40	5	2
	6	8	40	1	7
6AQ6	6	8	36	2	1, 7
	6	8	52*	2	5
	6	8	52*	2	6
6AT6	6	8	36	2	1, 7
	6	8	52*	2	5
	6	8	52*	2	6
6AU6	6	8	38	7	1, 2, 5, 6
6BA6	6	8	42	7	1, 2, 5, 6
6BE6	6	8	42	2	1, 5, 6, 7
6C4	6	8	30	7	1, 5, 6
6J6	6	8	46	7	1, 6
	6	8	46	7	2, 5
12AT6	8	8	36	2	1, 7
	8	8	52*	2	5
	8	8	52*	2	6
12BA6	8	8	42	7	1, 2, 5, 6
12BE6	8	8	42	2	1, 5, 6, 7
35W4	10	8	28	7	5
45Z3	10	2	28	4	2, 6
50B5	11	8	24	2	1, 5, 6, 7
9001	6	8	38	2, 7	1, 5, 6
9002	6	8	46	2, 7	1, 5, 6
9003	6	8	42	2, 7	1, 5, 6
9006	6	8	40	2, 7	1, 5

*Note: Any value over 20 on the zero to 100 scale is good.

SHEET-METAL OUTLINE

RALPH E. STUCKI
Dana Junior High School
San Diego, Calif.

I. *Selecting material*

A. Bill of material
1. Figure square feet and cost
2. Units in which items are sold

B. Measuring metal
1. Use of sheet metal and wire gauge
2. Measuring metal for cutting
a) Computing pieces in sheet
b) Nesting irregular pieces
(1) No waste

C. Kinds of sheet metal
1. Information identifying different kinds of sheet metal as used in the trade
a) Tinplate
b) Black iron
c) Galvanized iron
d) Copper
e) Brass
f) Aluminum
g) Lead
h) Garalloy

II. *Layout*

A. Parallel line
1. Elementary
a) Box or pan
2. Advanced
a) Intersecting stove pipes
b) Elbows

B. Radial
1. Funnel or flaring pan

C. Triangulation
1. On the drafting board
2. As used in the shop

D. Allowance for seams and wire

E. Notches
1. Square
2. Straight
3. Slant
4. V shaped
5. Wire
} [1]
[1] *a*) Reason for each
b) Where each is used

F. Terms used in layout
1. Stretchout line

G. Layout tools
1. Combination square
2. Rule
3. Scriber
4. Compasses
5. Dividers
6. Trammel points
7. Prick punch
8. Small ball-peen hammer
9. Circumference rule
10. Protractor
11. Steel square
12. Marking gauge
13. Straight edge — 8 ft.

H. Transferring patterns
1. Draw around the master pattern
2. Draw on paper and use the prick punch
3. Draw directly on the metal

III. *Cutting metal*

A. Snips
1. At a notch
2. On a straight line
3. Cut no rods, nails, or wire
4. Small piece of metal falls to the left if right-handed snips are used
5. Kinds of snips
a) Combination
b) Straight
c) Scroll
d) Double cutting
e) Hawk's-bill
f) Bulldog
g) Circular
h) Compound (double action)
i) Aviation
j) Trojan
k) Notching
(1) Place where each is used
(2) How each is used
(3) Names of the parts
6. Capacity of snips

B. Hack saw
1. How to use
a) Speed
b) Stance
c) How held in the hands
2. Selection of the blades
3. Kinds of hack saws
4. Direction teeth point in the frame

C. Cold chisel
1. In a vise
2. On a lead plate
3. Sharpening the chisel
4. Kinds of cold chisels
a) Where each is used

D. Shears
1. Bench
2. Squaring
a) Regular and gap
b) Foot and power
c) Safety information
(1) Hands away from the blade
(2) Foot not under treadle
3. Slitting
a) Lever
b) Rotary
c) Bench
d) Beverly
e) Power
4. Scroll
5. Circle
6. Ring and circle
7. Curved elbow
} [2]
[2] *a*) Description of each kind
b) Capacity of each
c) How and when used
d) Adjustments on each

IV. *Make a hole*

A. Solid punch
1. On lead or the end grain of wood
2. Sizes of punches

B. Hand punch
1. Changing dies
2. Sizes of the dies

C. Hollow punch
1. On lead or the end grain of wood
2. Sizes of the punches

D. Drill
1. Sizes of bits
a) Fractional, number and letter
2. Sharpening
3. Safety with drill press
a) Clamp work

E. Lever punch
1. Hand and power

F. Notching machine

V. *Bend metal* (This is special kind of forming. The metal is creased, and the creases show when the metal is straightened.)

A. By hand
1. Tools
a) Tongs
b) Handy seamer
c) Block and clamps
d) Mallet
e) Vise

B. In the bar folder
1. Hems
a) Open
b) Closed
c) Single
d) Double
2. Wiring a straightedge
3. Stops
a) 45 degree
b) 90 degree
c) Adjustable
4. Adjustments
a) Width of fold
b) Radius in bend
c) Clearance between the jaw and blade for gripping the material
5. Names of the parts
6. Capacity

C. In the brake
1. Kinds
a) Cornice
b) Pan or box
} [3]
[3] (1) Hand and power
(2) Capacity
(3) Names of the parts
(4) Where each is used
2. Adjustments
a) Laterally — slide jaw back and forth
(1) Adjust bend radius
b) Vertically — move jaw up and down
(1) Adjust for thickness of material clamped

D. Miscellaneous
1. Sheet-iron folder
2. Pipe bender
a) Flange for grooved seam on round pipes
3. Can-top folder

VI. *Form metal*

A. Stakes
1. Names
2. How used
a) Square work
b) Circular work
c) Conical work
d) To form wire
} [4]
[4] (1) Making special seams
(2) Straight bends
(3) Stakes to use for each kind of work
3. Care of the stakes
4. Use a mallet in forming metal

B. Dolly bars
1. Making flanges
2. Straighten seams
3. *Back up* material in bumping

C. Rotary machines
1. Turning
2. Burring
3. Wiring
4. Setting down
5. Crimping
6. Beading
7. Double seaming
8. Elbow edger
9. Crimping and beading
10. Easy edger
} [5]

*a) Hand and power
(1) Capacity of each
b) Adjustments on each machine
c) Special work each machine does

D. Forming rolls
1. Hand and power
a) Capacity of each
2. Grooves for wire or wire edge
3. Funnel forming machine
a) Special kind of forming rolls

E. Molds on the brake
1. Friction stops

F. Gutter beading machine

G. Raising or bumping metal
1. Stretching and shrinking metal

H. Metal spinning

VII. *Join metal together*

A. Soldering
1. Knowledge of solder and fluxes
a) Flux for each metal
2. Kinds of coppers
a) Use of each kind
b) Weight
c) Why copper is used
3. Tinning soldering copper
4. Blow torch and electric soldering copper
5. Charcoal or gasoline firepot
a) Building charcoal fire

B. Riveting
1. Tools used
a) Riveting hammer
b) Rivet set (3 uses)
2. Riveting a long seam
3. Knowledge about rivets
a) Kinds
b) How ordered
c) Size used depends upon the gauge of the metal

C. Seams
1. Lap — soldered or riveted
a) Joggled
b) Corner
(1) Flush corner
2. Folded
a) Use of the barfolder
3. Groove fold
a) Tools
(1) Mallet, hand groover, hammer
(2) Grooving machine
4. Double
a) Tools
(1) Setting down hammer or machine, square stake, double seaming stake, double seaming machine, dolly bar
b) On circular work
c) On square work
5. Pittsburgh lock
a) Tools
(1) Brake, mallet, hammer, dolly bar
b) Use in heating duct work
6. Dovetail
7. Butt
a) Riveted
8. Roof seams
*(1) How to make each
(2) Amount of material necessary for seam
(3) Value of each
(4) Where each is used
9. Solder lock
10. Drive and slip cleats
a) In ventilating and heating work

D. Welding
1. Spot
2. Brazing
3. Electric
*a) Operation of the machine
b) Materials suitable

E. Screws and bolts
1. Parker-Kalon (PK)
a) Type A and Z (self-threading)
2. Stove bolts

VIII. *Auxiliary operations*

A. Tighten head on a hammer
B. Sharpen squaring shear knives
C. Sharpen scriber
D. Sharpen center punch
E. Sharpen prick punch

Sheet Metal Operations

1. Read a working drawing
2. Plan a procedure of operations
3. Check material as received
4. Make out a bill of material
5. Measure metal for cutting
6. Elementary parallel line layout
7. Advanced parallel line layout
8. Radial line layout
9. Triangulation layout
10. Transfer patterns
a) Master pattern
b) Pattern on paper and transferred with a prick punch
c) Drawn directly on the metal
11. Cut metal with snips
12. Cut metal with a hack saw
13. Cut metal with a cold chisel
14. Cut metal with bench shears
15. Cut metal with squaring shears
16. Cut metal with lever slitting shears
17. Cut metal with rotary slitting shears
18. Cut metal with bench slitting shears
19. Cut metal with Beverly slitting shears
20. Cut metal with power slitting shears
21. Cut metal with scroll sheafs
22. Cut metal with circle shears
23. Cut metal with ring and circle shears
24. Cut metal with curved elbow shears
25. Punch a hole with a solid punch
26. Punch a hole with a hand punch
a) Changing dies
27. Punch a hole with a hollow punch
28. Drill a hole with a twist drill
29. Punch a hole with a lever punch
30. Punch a hole with a notching machine
31. Bend metal by hand
32. Bend metal in the bar folder
33. Wire a straight edge
34. Bend metal in the brake
35. Bend metal in the sheet-iron folder
36. Bend metal in the pipe bender
37. Form metal on stakes
38. Wire a curved edge
39. Form metal by burring
40. Form metal on the crimping machine
41. Form metal on the beading machine
42. Form metal on the double seaming machine
43. Form metal on the elbow edger
44. Form metal on the easy edger
45. Form metal on the forming rolls
46. Form metal on the brake molds
47. Form metal on the gutter beading machine
48. Form metal by raising or bumping
49. Form metal by spinning
50. Tin a soldering copper
51. Soldering
52. Light a blowtorch
53. Build a charcoal fire
54. Make a soldered lap seam
55. Riveting
56. Make a riveted lap seam
57. Make a joggled lap seam
58. Make a grooved folded seam
59. Make a double seam
60. Make a Pittsburgh lock
61. Make a dovetail seam
62. Make a butt riveted seam
63. Make roof seams
64. Make a solder lock seam
65. Make a drive cleat
66. Make a slip cleat
67. Spot welding
68. Brazing
69. Acetylene welding
70. Fasten metal with PK screws
71. Fasten metal with stove bolts

Auxiliary Operations

1. Sharpen cold chisel
2. Sharpen drill bit
3. Tighten head on the hammer
4. Sharpen a scriber
5. Sharpen center punch
6. Sharpen prick punch
7. Sharpen squaring shear knives

Information Topics

1. Kinds of sheet metal
2. Solders
3. Fluxes
4. How to figure square feet and inches
5. How to find the circumference and areas of curved surfaces
6. Descriptions and pictures of tools for each operation
a) Layout
b) Cutting metal
c) Making a hole
d) Bending metal by hand
e) Stakes
f) Soldering
g) Riveting
h) Seams
7. Kinds of snips and the use of each
8. Safety information
a) Soldering
b) Squaring shears
c) Drill press
9. Sizes of punches and drill bits
10. Kinds of rivets, how ordered and size used
11. Importance of sheet-metal work
12. Soldering coppers
13. Manufacture of sheet iron
14. Manufacture of galvanized iron
15. Manufacture of copper
16. Manufacture of tinplate
17. Manufacture of aluminum
18. Opportunities in the small sheet-metal shop
19. Sheet metal in modern design
20. Employer-employee relationships in sheet-metal work
21. Training for the sheet-metal worker
22. Air conditioning work

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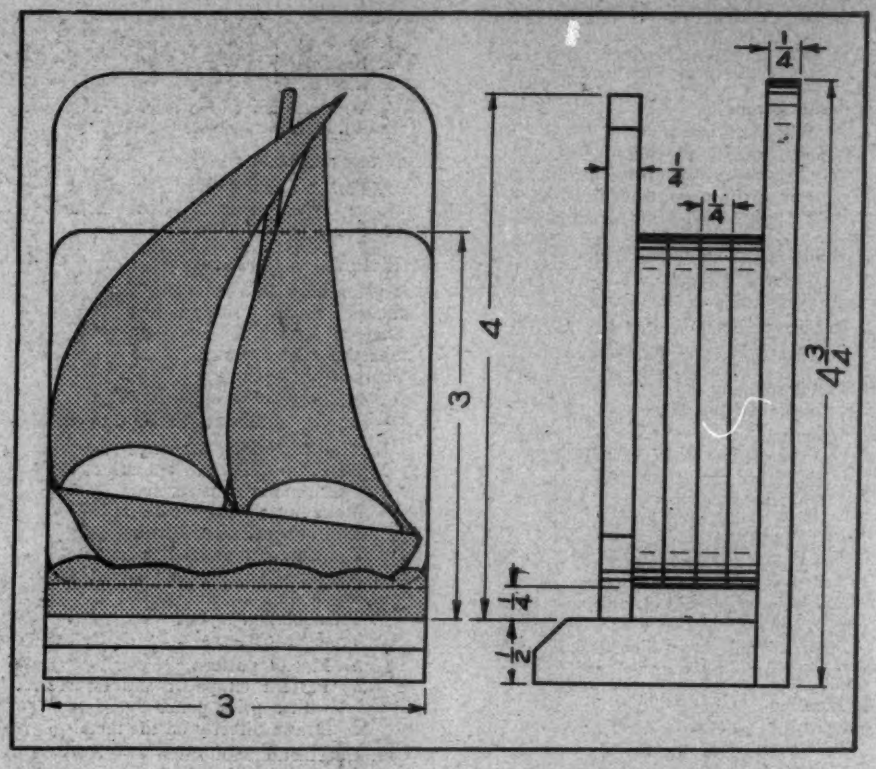

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TO BE A GOOD INDUSTRIAL-ARTS TEACHER, YOU MUST TEACH

GUY O. TOLLERUD

Director, Industrial Arts Department

Austin, Minn.

A shop teacher is often looked upon as a man surrounded with tools, machines, and materials, and that his main job is to put the class to work making projects selected by the boys under his guidance. He is often a person who has selected his profession because of certain mechanical skills and aptitudes with which he finds himself endowed. Of course, he must know certain things as a teacher but shop teachers are so often thought of, by administrators and even by themselves, as teachers whose pupils learn to do mainly by doing. We also hear of school administrators who believe that instructional material, especially books, belong to the academic teacher and have little place in the shop.

Experience as a shop teacher and supervisor of industrial-arts work has impressed the fact upon me that the shop teacher must be a strong teacher in imparting facts, knowledges, steps, methods, and procedures in his daily teaching. It is easy for a shop teacher who has acquired many of his skills and knowledges out of his own or his father's workshop because of his aptness along these lines, to expect his students to do likewise when given the tools and materials to work with. He forgets that he may be rather an exceptional learner and that in his industrial-arts classes, only the exceptional students can acquire knowledge and skills that way. The great majority of them do not have such abilities and must have definite instruction in their work. Because of this biased notion, the shop teacher often gets disgusted with the students who do not do things well, who spoil material, and who do not show interest in their work. He forgets that they may not have been shown the proper manner of how to do the work assigned them. He should remember that they are inexperienced, and that it is his job to *teach* them how to do the work represented by his course.

The boys coming to our schools now, on the whole, have less experience in the art of handling tools and materials than their predecessors. Their home training along these lines, because of city life and their father's specialized work, does not compare with that received by their fathers and grandfathers.

Another tendency of the shop teacher is to feel that each new succeeding class should, somehow or other, be a continuation of the preceding class and should be able to carry on rather than be a "beginning all over again class." Each new class is a *"beginning all over again"* proposition to the teacher and he must adjust himself personally and professionally to meet the situation in hand. While the materials to be taught must be retaught to the new groups, yet the teaching techniques and procedures should not only be varied, but improved each time.

There are no classes in which exact teaching knowledge is of greater importance than it is in the school shop. Here the students are working with expensive materials that must not be wasted; with tools that are sharp and that must be used properly if the work is to be done correctly; with machines that must be used correctly or life and limb may be sacrificed; with forces that can do great good or that may destroy the very men who should be their masters.

A boy in woodworking should not be allowed to use the trial and error method in learning how to use materials and tools. The best practices of the most skilled craftsmen of the ages should be brought to him by his teacher. It is only in this way that he will learn to master the tools and machines in the shortest possible time.

The industrial-arts instructor must *teach* and to do so he must have not only tools, machines, and materials, but also books, pamphlets, mimeographed material, tests, blackboards, and chalk together with seats or chairs in a section of his shop where suitable instruction may be carried on. Fortunately, books, pamphlets, slides, films, and other illustrative teaching material is now becoming increasingly available, and these coupled with good demonstrations furnish effective avenues of approach to do an excellent job of instruction.

The best trained students will be the products of the course that has been best taught, and it is only from such courses that the teacher receives the greatest degree of personal satisfaction, and the gratification that accompanies a thorough job of teaching.

OVERCOMING HANDICAPS

A veteran who lost his sight in a TNT blast in New Britain two years ago is assembling metal switch boxes at the Bull Dog Electric Products Company, Detroit, Mich.

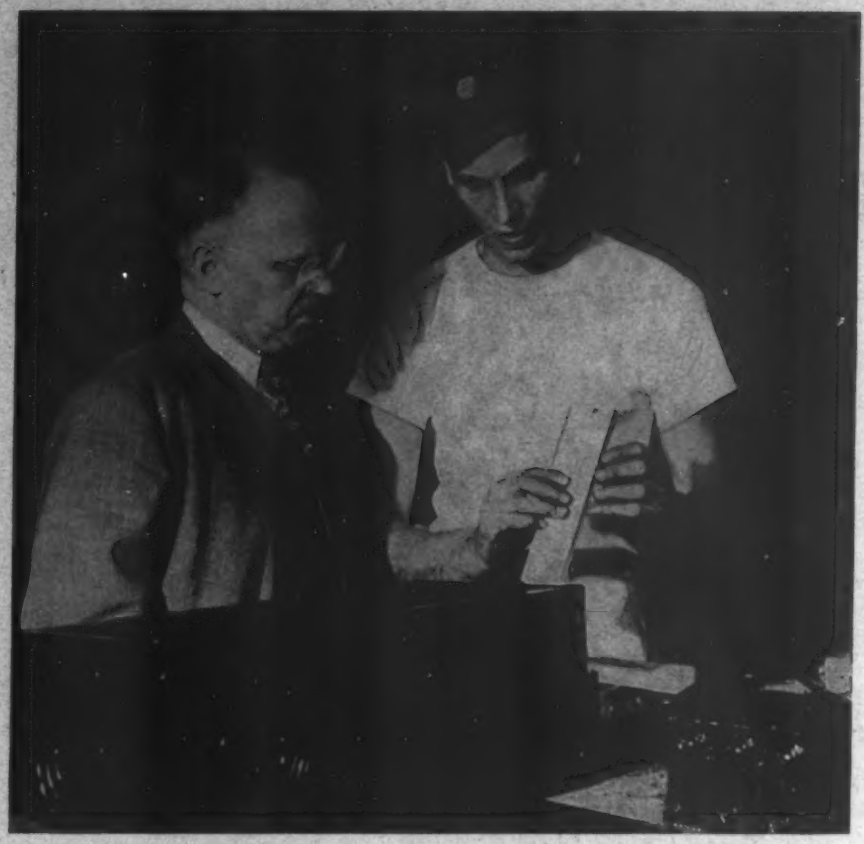
Working entirely by touch, ex-Sgt. Theodore Wildon performs more than 30 operations to assemble each switch box. He first places various sections of a box in separate piles on his workbench. Then sensitive fingers slip the pieces into place with the help of wrenches, rawhide hammer, twister, box wrench, and an electrically driven screw shooter.

Wildon acquired his skill and remarkable memory for details at the Bull Dog plant before the war. When he returned several months ago, his employers were slightly apprehensive that he might hurt himself in the machinery. At first, his work was closely supervised by Willard W. Perrine, state placement agent of the Division of Services for Blind, and Wilber H. Johnston, training section of the Veterans Administration's vocational rehabilitation and education division.

Within a few weeks, Wildon had learned his way around the department, with the use of a white cane, and carefully memorized the location of each tool crib and workbench.

Now, when Wildon arrives at the plant, he makes his way to his department, feels for his time card in the rack and punches in. At quitting time he takes his place in line and punches out unaided.

His bosses say "He does as much work as men with sight."



Training officer Wilber H. Johnston watches blind veteran Theodore "Ted" Wildon assembling switch box at the Bull Dog Electric Products plant, Detroit, Mich.

INDUSTRIAL-ARTS APTITUDE TEST

R. A. SCHWALM

Highland Junior High School

Barberton, Ohio

Letter your name here:

....

Last First Middle

The grade you are in .....

Date of test .... 19...

Month Day Yr.

Age now .... Semesters of industrial arts taken .....

years months

Grade on pretest ..... Grade on final test ..... Difference .....

Explanation

Pages 2 and 3: On these two pages are pictures of tools used in industrial-arts classes. Each tool has a number. On the lower portion of the page there are numbered spaces for you to write the name of each tool. Be sure that the number of the tool corresponds to the number in the space. Each tool correctly named is worth two points.

Page 4: On this page there are several types of problems. At the top of the page there are seven pictures of machines usually found in the shop. Each machine is numbered. Find the corresponding number in the spaces provided for the names of the machines and write in the correct name of that machine. Each correct answer is worth five points.

On this page there also is a drawing of a tabouret. In the bill of material shown, fill in the spaces necessary for the tabouret. The space below and to the left of the form is to be used for computation purposes. Be sure that all computation is done in this space. The bill of material if correctly made is worth 25 points.

On the lower portion of the page are 19 steps in making the tabouret. These steps are not in the correct working order. You are to place them in their correct order by placing a (1) in front of the first step, a (2) in front of the second step, and so on until all 19 steps are in order. Each step in correct order is worth two points.

Below are 19 steps for making the tabouret. They are not in correct order. Place them in order by placing a (1) in front of the first step, a (2) in front of the second step, and so on until all steps are in order.

( ) Select the proper size wood drill bit and bore pilot holes.
( ) Sand each piece of the tabouret carefully with No. ½ and No. 0 sandpaper.
( ) Select proper size gimlet bit and bore anchor holes.
( ) Make the cross-lap joint for the stretcher.
( ) Fasten the stretcher in place between the legs as shown in the drawing.
( ) Mark the location for holes to be bored in the legs for the screws to be used in assembling.
( ) Apply glue and clamp the cross-lap joint together.
( ) Apply shellac and the remaining finishing coats to the project.
( ) Cut top to octagonal shape and plane edges true.
( ) Lay out and cut the designs on the legs.
( ) Cut out stock for the top and square it.
( ) Check all pieces carefully to see that they are square and that mill marks have been removed.
( ) Apply soap to the threads of the screws and fasten the legs to the top with them.
( ) Give all surfaces a final sanding with No. 2/0 sandpaper.
( ) Cut out two pieces of stock for the stretcher at the bottom and square them to dimensions of ¾ x 2½ x 10 in.
( ) Cut out stock for four legs and square them to dimensions of ¾ x 2½ x 16½ in.
( ) Lay stock in place and mark places for anchor holes.
( ) Apply stain to all parts and allow to dry 8 hours.
( ) If an open grained wood is used, fill its pores with paste filler and allow it to dry.

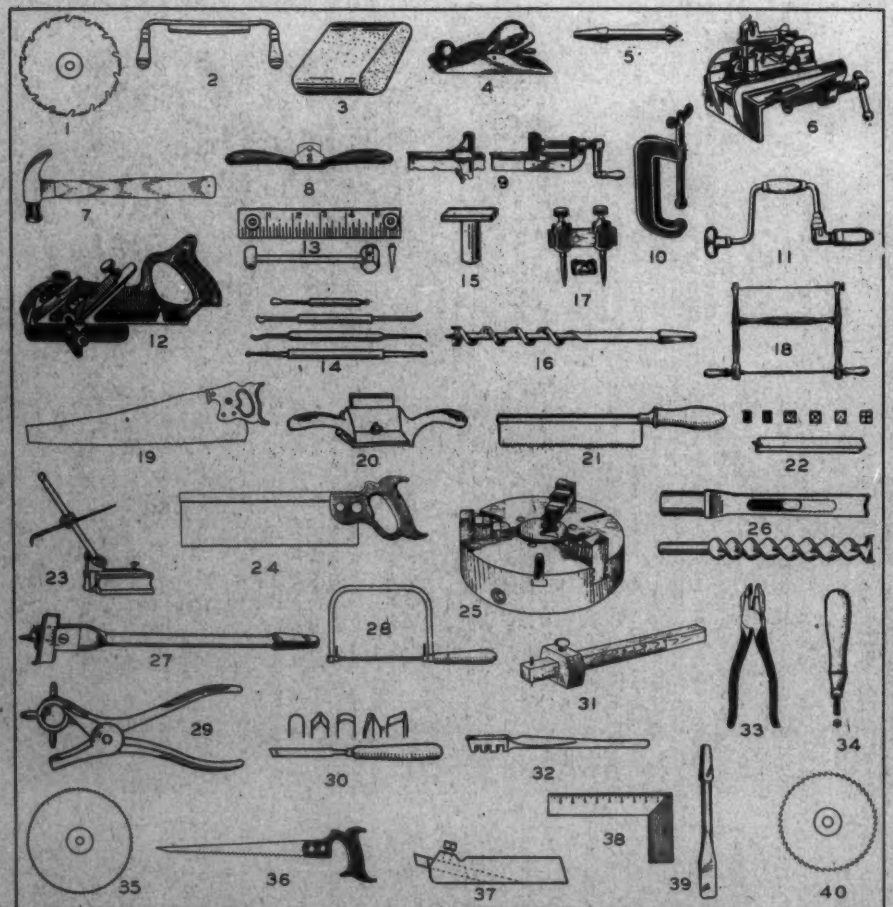
Page 5: At the top of this page is a picture of a plane with all its parts. Each part has a number. To the right of the pictures are 12 spaces with numbers. Locate each number on the drawing and then in the space write the name of that part. Each correct answer is worth two points.

Next there are pictures of six common wood joints. Each one has a number. After the corresponding number directly below the pictures write the correct name of the joint. Each correct answer is worth two points.

In the middle of the page there are two pictures of handsaws. You should be able to recognize each one by the shape of the teeth. Below each picture name the saw. Each correct answer is worth two points.

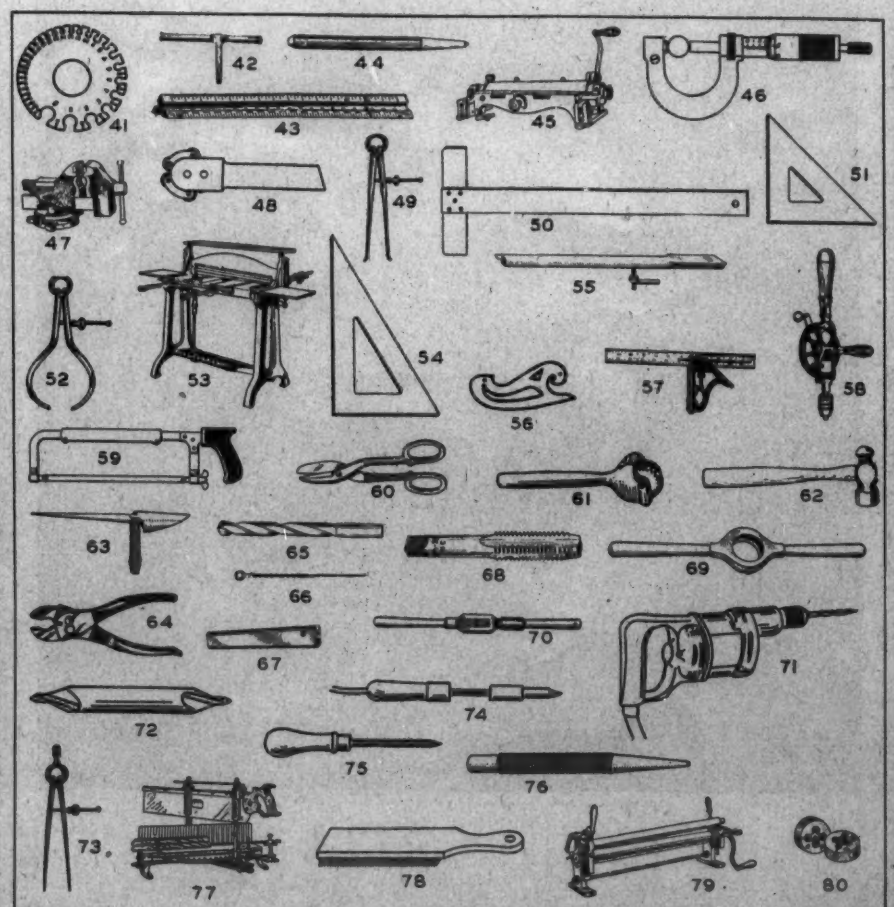
To the right of the handsaws are five common sheet-metal joints. Below each joint write the name of the joint. Each correct answer is worth two points.

On the lower portion of the page are eight operations which are done in the shop. In the



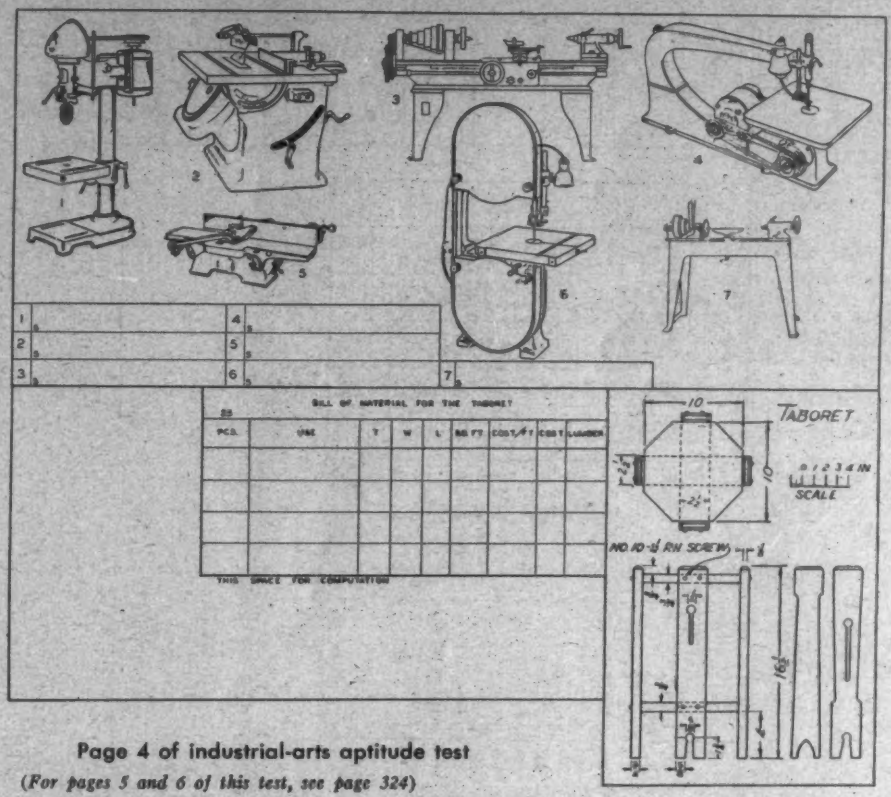
1	11	21	31
2	12	22	32
3	13	23	33
4	14	24	34
5	15	25	35
6	16	26	36
7	17	27	37
8	18	28	38
9	19	29	39
10	20	30	40

Page 2 — Tools. Industrial-arts aptitude test



41	51	61	71
42	52	62	72
43	53	63	73
44	54	64	74
45	55	65	75
46	56	66	76
47	57	67	77
48	58	68	78
49	59	69	79
50	60	70	80

Page 3 of industrial-arts aptitude test



Page 4 of industrial-arts aptitude test

(For pages 5 and 6 of this test, see page 324)

space below each operation write a short description of the operation. Be sure that the names of the tools in each picture are used in the written description. Each operation if correctly described is worth five points.

Page 6: In the upper right hand corner of this page is an isometric drawing of an object. To the left of this drawing are squares. In these squares you are to make a freehand three-view orthographic drawing of the object. Each square is equal to one inch. If the drawing is correctly made it is worth thirty points.

Key for Industrial-Arts Aptitude Test

Page 2

1. Combination circular saw
2. Drawknife
3. Slipstone
4. Block plane
5. Countersink
6. Dowel jig
7. Claw hammer
8. Spokeshave
9. Bar clamp
10. C clamp
11. Brace
12. Combination plane
13. Snap fastener set
14. Modeling tools
15. Bench stop
16. Auger bit
17. Trammel points
18. Turning saw
19. Handsaw
20. Cabinet scraper
21. Dovetail saw
22. Metal Stamps for leather
23. Surface gauge
24. Backsaw
25. Universal chuck
26. Mortising chisel
27. Expansive bit
28. Coping saw
29. Adjustable leather punch
30. Wood lathe chisels
31. Marking gauge
32. Glass cutter
33. Side cutting pliers
34. Stippler
35. Crosscut circular saw
36. Keyhole saw
37. Lathe toolholder and bit
38. Try square
39. Screw driver bit
40. Ripsaw blade (circular)

Page 3

41. U.S.S. gauge
42. Double seaming stake
43. Boxwood scale
44. Center punch
45. Bar folder
46. Micrometer
47. Machinist's vise
48. Knurling tool
49. Inside calipers
50. T square
51. 45-degree triangle
52. Outside calipers
53. Squaring shears
54. 30–60 degree triangle
55. Hollow mandrel
56. French curve
57. Combination square
58. Hand drill
59. Hack saw
60. Tinner's snips or shears
61. Wheel dresser
62. Ball-peen hammer
63. Blow horn stake
64. Combination pliers
65. Twist drill
66. Scriber
67. Rivet set
68. Tap
69. Die stock
70. Tap wrench
71. Electric drill
72. Combination drill and countersink
73. Dividers
74. Electric soldering iron
75. Burnisher
76. Nail set
77. Miter saw
78. File card and brush
79. Forming rolls
80. Die

Page 4

1. Drill press
2. Circular saw
3. Metal lathe
4. Jig saw
5. Jointer
6. Band saw
7. Wood lathe

Bill of Material

No. of Pcs.	*Name*	*Size*
1	Top	¾ x 10 x 10 — 25/36 bd. ft.
2	Braces	¾ x 2½ x 10 — 25/72 bd. ft.
4	Legs	¾ x 2½ x 16¼—1 7/48 bd. ft.
16	Screws	No. 10 x 1½ r.h.

Steps for the construction problem

1.	9	6.	8	11.	3 or 1	16.	1 or 3
2.	13	7.	7	12.	12	17.	10
3.	11	8.	19	13.	14	18.	17
4.	6	9.	4 or 2	14.	16	19.	18
5.	15	10.	2 or 4	15.	5		

Page 5

1. Plane iron lever cap
2. Plane iron cap
3. Single plane iron
4. Double plane iron
5. Plane knob
6. Plane handle
7. Lateral adjusting leaver
8. Adjusting nut
9. Handle bolt and nut
10. Lever cap screw
11. Y adjusting lever
12. Cap screw

Wood Joints

1. Butt
2. Middle lap
3. End lap
4. Dowel
5. Dado
6. Rabbet

Types of Saws

1. Rip
2. Crosscut

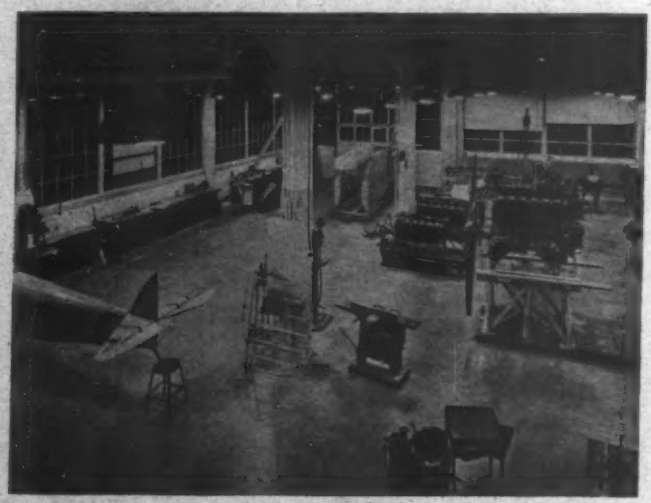
Metal Joints

A. Sharp lock
B. Open lock for wire edge
C. 90-degree flange
D. Closed lock or single hem
E. Double hem

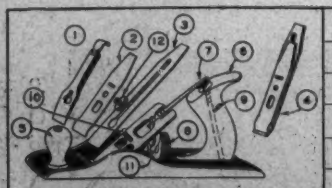
Operations (reading from left to right across the page)

1. Sawing a piece of metal. Hack saw and metal vise.
2. Threading a piece of metal. Stock and die and metal vise.
3. Tapping a hole. Tap wrench, tap, and metal vise.
4. Setting a nail. Hammer and nail set.
5. Tinning a soldering copper. Soldering copper and sal ammoniac.
6. Drawfiling a piece of metal. File and metal vise.
7. Forming a wire edge by hand. C clamps and rivet hammer.
8. Squaring a board. Framing square and pencil.

The principal source of deaths in industry as a whole, is the operation of trucks, railroad cars, and other types of vehicles which accounted for 23 per cent of all compensated fatalities. — *National Safety Council.*

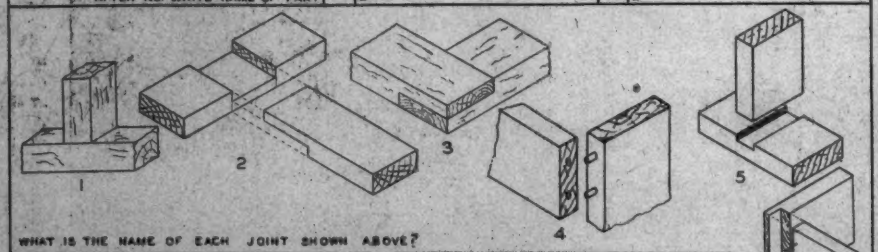


Aeronautics shop. Macomber High School, Toledo, Ohio



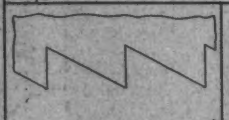
AFTER NO. WRITE NAME OF PART

1	2	7	2
2	2	8	2
3	2	9	2
4	2	10	2
5	2	11	2
6	2	12	2

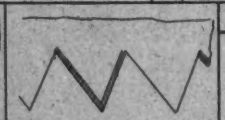


WHAT IS THE NAME OF EACH JOINT SHOWN ABOVE?

1	2	4	2
2	2	5	2
3	2	6	2

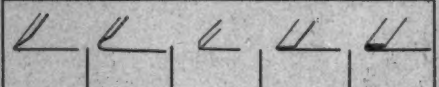


IS THIS A RIP OR CROSSCUT? 2

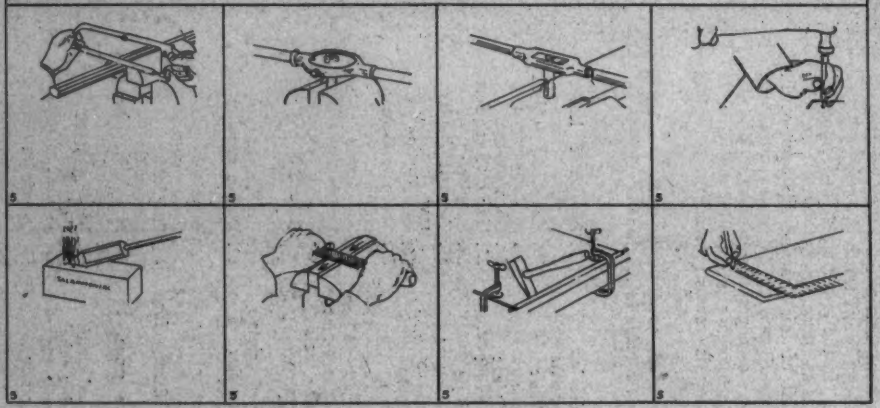


IS THIS A RIP OR CROSSCUT? 2

WHAT IS THE NAME OF EACH METAL JOINT SHOWN BELOW?



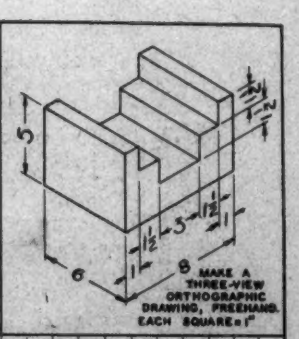
BELOW ARE 8 OPERATIONS. BELOW EACH PICTURE DESCRIBE THE OPERATION USING THE NAME OF EACH TOOL USED.



5 5 5 5

5 5 5 5

Page 5 of industrial-arts aptitude test (See text on page 321)



SCORES FROM	SCORES TO	GRADE	SCORES FROM	SCORES TO	GRADE	SCORES FROM	SCORES TO	GRADE	SCORES FROM	SCORES TO	GRADE	SCORES FROM	SCORES TO	GRADE
374	378	99	306	309	81	238	241	63	170	173	45	102	105	27
370	373	98	302	305	80	234	237	62	166	169	44	98	101	26
366	369	97	299	301	79	231	233	61	163	165	43	94	97	25
362	365	96	295	298	78	227	230	60	159	162	42	91	93	24
359	361	95	291	294	77	223	226	59	155	158	41	87	90	23
355	358	94	287	290	76	219	222	58	151	154	40	83	86	22
351	354	93	284	286	75	215	218	57	147	150	39	79	82	21
348	350	92	280	283	74	212	214	56	144	146	38	76	78	20
344	347	91	276	279	73	208	211	55	140	143	37	72	75	19
340	343	90	272	275	72	204	207	54	136	139	36	68	71	18
336	339	89	268	271	71	200	203	53	132	135	35	64	67	17
333	335	88	265	267	70	197	199	52	129	131	34	60	63	16
329	332	87	261	264	69	193	196	51	125	128	33	57	59	15
325	328	86	257	260	68	189	192	50	121	124	32	53	56	14
321	324	85	253	256	67	185	188	49	117	120	31	49	52	13
318	320	84	249	252	66	181	184	48	113	116	30			
314	317	83	246	248	65	178	180	47	110	112	29			
310	313	82	242	245	64	174	177	46	106	109	28			

REMARKS:

PAGE	SCORE
1	
2	
3	
4	
5	
6	
TOTAL SCORE	
GRADE	

Page 6 of industrial-arts aptitude test

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(*Continued from page 275 of the June, 1946, issue*)

The Big Bad Wolf

There is no denying the fact that the bad wolf shown in Figures 210 and 211 is rather a sorry looking critter, but he is not as tough as he looks. That is he isn't hard to whittle, because you can't make him look worse than he is depicted here. If you can improve on his *bad* looks the author would like to see a

Fig. 211. The surly, slinking, big bad wolf

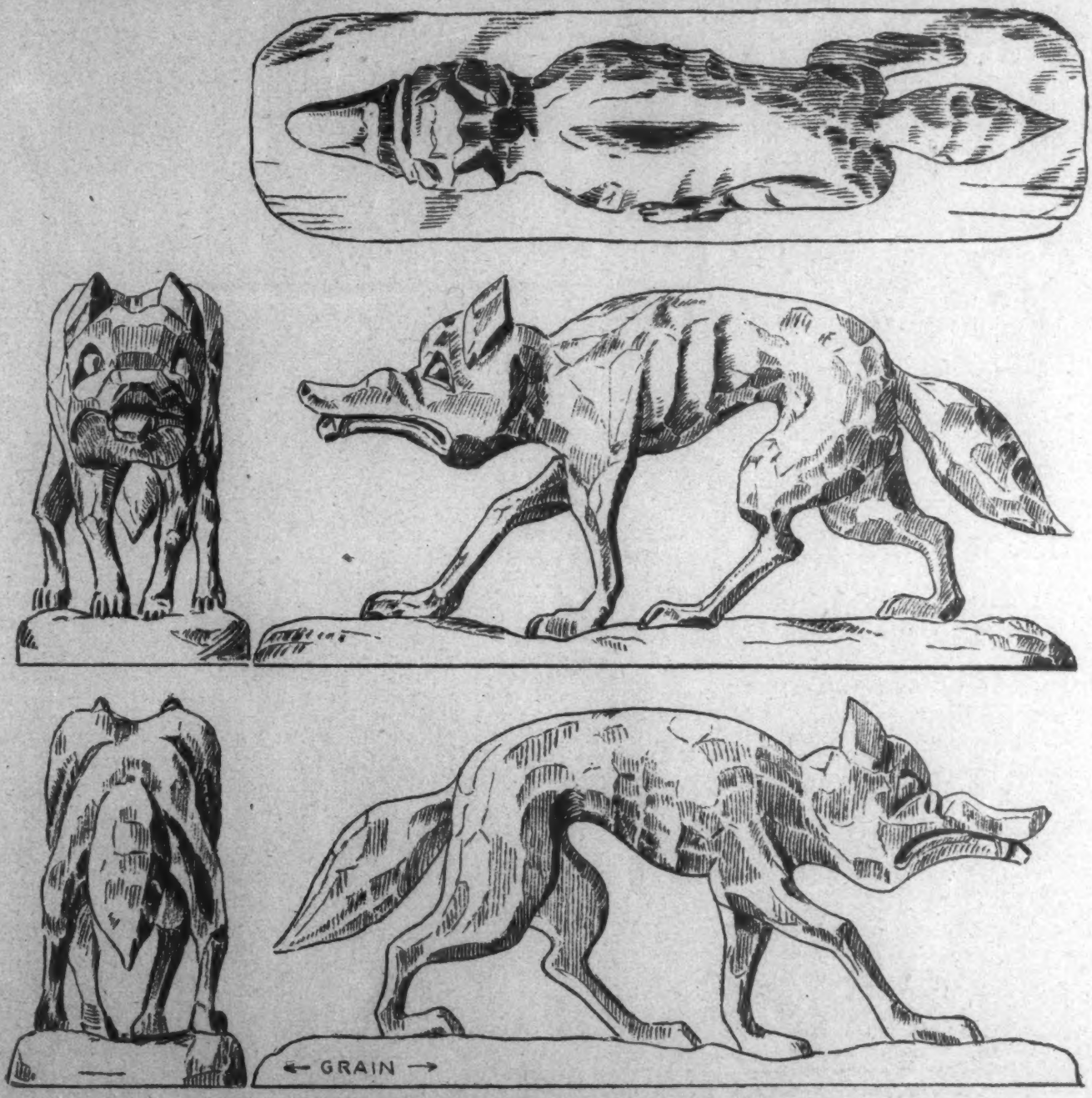


Fig. 210. Full-size patterns of the big bad wolf

photograph of him when you have finished whittling.

There isn't much to be said regarding the actual whittling, although it might be well to point out one very common mistake that nearly all beginners make, and that is, they don't, as a rule, take off enough wood. When you think you have finished whittling, you can usually go over the entire surface again with a razor sharp knife and still have a good figure left, and as a rule, one that will have better lines than before. Try this on this wolf and don't sand the finished job. You have most likely noticed that the perspiration from your hands, even if you think they are dry, will soil a nice white whittling job. This happens because you are gripping the wood so tightly that your hands perspire. Using an eraser on the wood will not remove the stain, so just go over the entire figure with a sharp knife, cleaning up the carving and at the same time thinning it down.

FUNDAMENTALS OF BLUEPRINT READING

C. H. NIEMANN

Hammond, Ind.

Since the reading of a blueprint is the deciphering of the language of the mechanical world, it becomes quite evident that the easier this language is made to the patternmaker, machinist, carpenter, assembler, and others, the greater will be our production of all kinds of machinery, airplanes, bridges, vessels, buildings, and the like.

Many of our future tradesmen are now being developed in vocational and technical high schools, and it is during this period of their educational life that they should learn the language of mechanical drawing, and the reading of blueprints.

The series of problems shown herewith, and others that will follow, are presented to help in the development of a worth-while blueprint reading course. The writer invites criticisms and suggestions to make a co-operative effort to improve the teaching of this important subject.

(For problems referred to, see pages 327, 328, 329 and 330)

IMPROVING THE DRAFTING ROOM

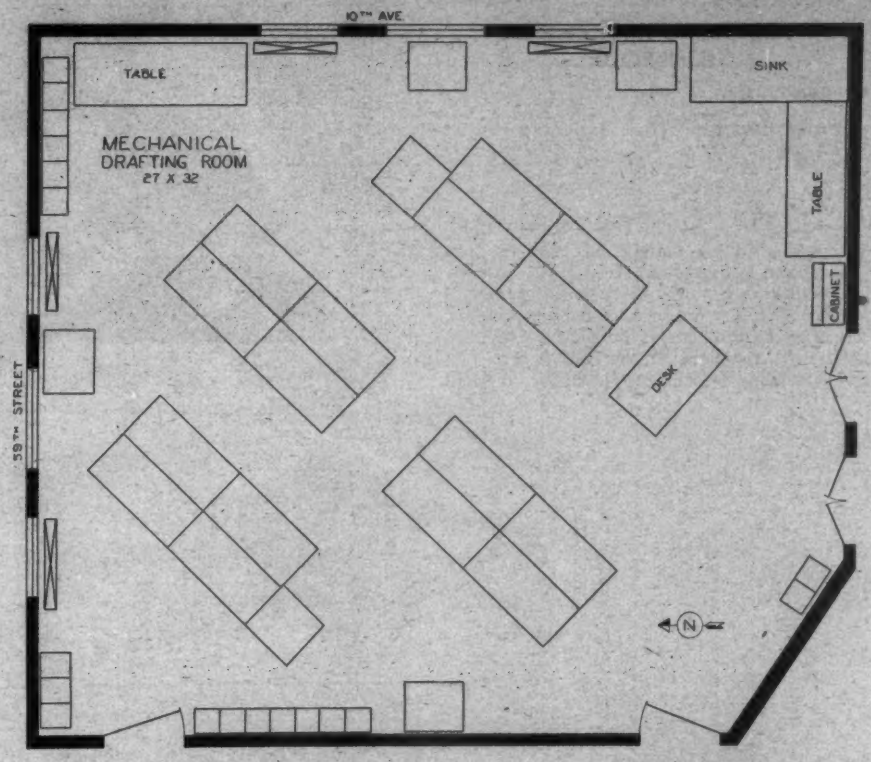
SAMUEL S. SCHIFFER

Teacher of Drafting

Haaren High School

New York City

There is a healthy trend in mechanical drawing in the high schools, particularly in the industrial-arts group. The emphasis in teaching is away from the design pattern and extensive drill. Where there is an overemphasis on technique and line quality, truth in drawing and visualization on the part of the student both suffer. It is important to provide fuller experiences with objects, and to make the drawing the record of those experiences which include use, materials, processes, and many other factors. This is true to actual practice except in the case of a tracer. In such an atmosphere there will be established a better relationship between student and teacher. Certainly the awe and mystery surrounding both drawings and objects will be lessened. One of the projects undertaken by my class was the improvement of our drafting room.



Drafting room, Haaren High School, New York City

This room is quite large with large windows on both the north and east walls. Double benches were arranged in orderly rows seating 32 and spread out so that the room was well covered but not crowded. Other provision was made for an additional 8 seats. The atmosphere, of course, was one of isolation and remoteness. In addition, the distribution of materials was a lengthy, involved process. The north light was from behind the students and the east light over the left shoulder. However, during the *sun* days it was necessary to draw the blinds for most of the time, leaving a meager yellow electric glow in the room.

The rearrangement of the room shown in the accompanying illustration was then tried with a view to alleviating some of the factors usually found in the drab, formal classroom. In the first place, the novelty of any change made such a hit with the students that there was an immediate change in attitude. What was to be a shift just "to see how it looks," has remained for two years as a permanent plan. This arrangement of benches provides a distributed light, balanced as much as possible under the circumstances, for the greatest number of pupils. Three fourths of the students are practically in the windows.

Since there are four groups, of 8 each, the distribution of material has become much more simple than when there were 32 individuals. There used to be a never ending rumpus and now it is accomplished by 4 monitors in 3 minutes.

The room looks very spacious and free of encumbrances. Pupils can move around very freely without disturbance. The teacher can see the work at a glance and can move around from table to table very quickly and unobtrusively. Generally, the change built up a tremendous psychological lift.

It might be argued that the fact that 8 boys face each other while doing mechanical drawing lends itself to disciplinary problems and invites copying. The opposite is true. Since the isolation and tightness of the formal classroom no longer exists, the need for antithetical protest has been removed. The boys feel at home and behave as they naturally want to.

CO-OPERATIVE PROGRAM IN COMMERCIAL ART

W. E. STIRTON

Principal, Cass Technical High School
Detroit, Mich.

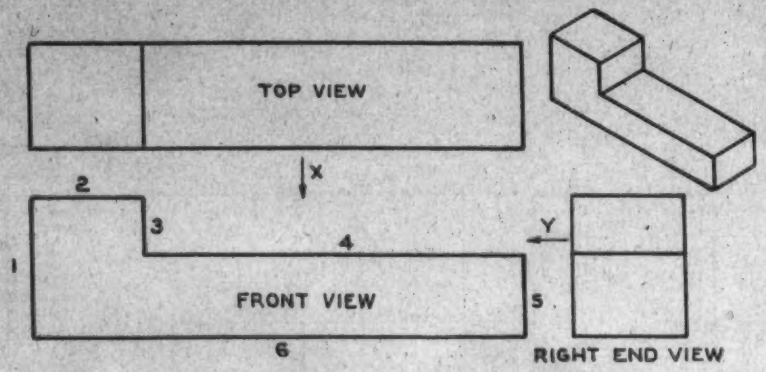
Co-operative programs have been successfully operated in a few fields for many years. It is somewhat surprising that this type of educational endeavor has not been extended over a wider range of subject matter. There are many instances of outstanding programs in machine shops, com-

(Continued on page 330)

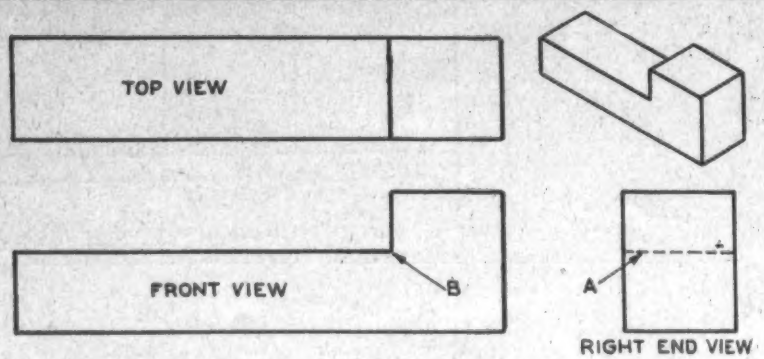
INFORMATION — 1

THREE-VIEW DRAWINGS

The three-view drawing of the step block shows the top, front, and side views and their relation to each other. For example: the top view is directly above the front view and the right end view is directly opposite and to the right of the front view. **Note:** the top view shows how the step block would look if you were looking down on the front view, as indicated by arrow X. The right end view shows how the step block would look if you were looking at it in the direction of the arrow Y.



Note: Length of front and top views are equal. Height of end view is same as height of front view. Width of end view is same as width of the top view.

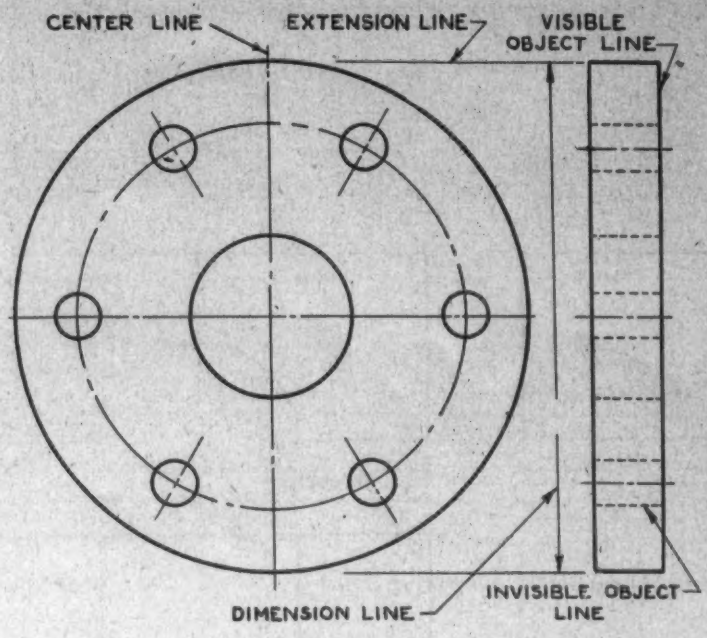


Note: If the step block were drawn as shown above, it would be necessary to show the line A dotted because the edge B cannot be seen.

INFORMATION — 1-A

KINDS OF LINES AND THEIR USES

The drawing and description of the various kinds of lines and their uses show how these lines are used in the making of a working drawing.

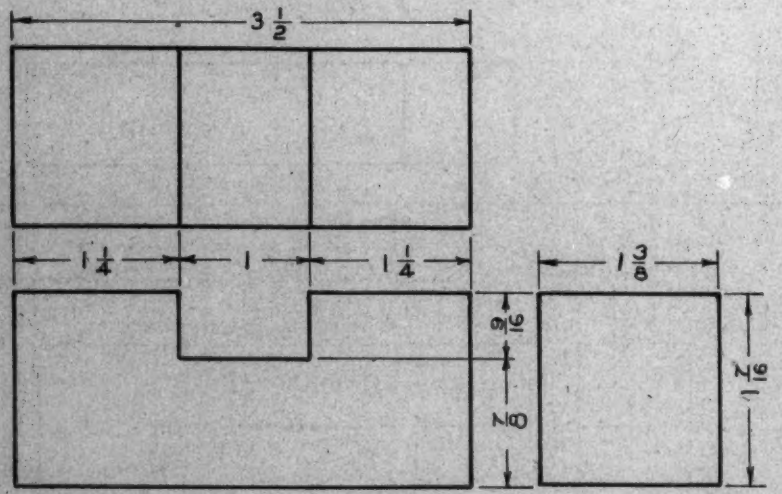


Center line ——— - ——— Used to locate and show the center of the object being drawn.
Visible Object Line ——————— Used to show those edges and surfaces that can be seen.
Invisible Object Line — — — — Used to show those edges and surfaces that cannot be seen.
Extension Line ——————— Used in connection with dimension lines, so they can be properly located.
Dimension Line ←—— ——→ Used in connection with dimensions so they can be properly shown.

Fundamentals of blueprint reading. C. H. Niemann, Hammond, Ind. (See article on page 326)

Job 1. Complete the views by drawing in the missing lines. Answer the questions.
Purpose: To show the use of invisible lines.

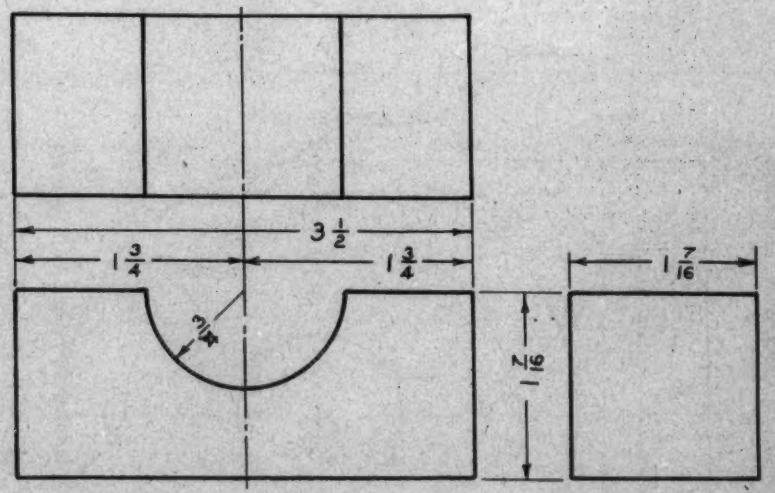
Note: See information—1 and 1-A for Jobs 1 to 5.



1. Length of groove = _____
2. Width of groove = _____
3. Depth of groove = _____

Your Name Date Completed

Job 2. Complete the views by drawing in the missing lines. Answer the questions.
Purpose: To show the use of invisible lines.



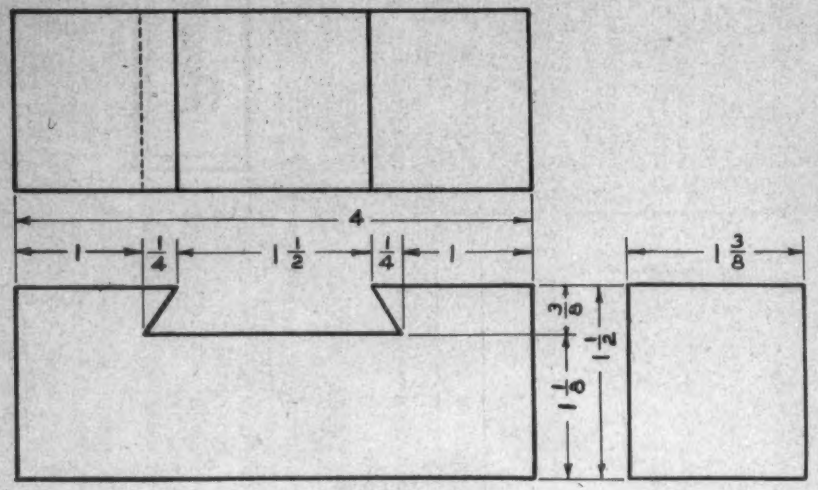
1. Diameter of groove = _____
2. Depth of groove = _____

Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Hammond, Ind. (See article on page 326)

Fundamentals of blueprint reading. C. H. Niemann, Hammond, Ind. (See article on page 326)

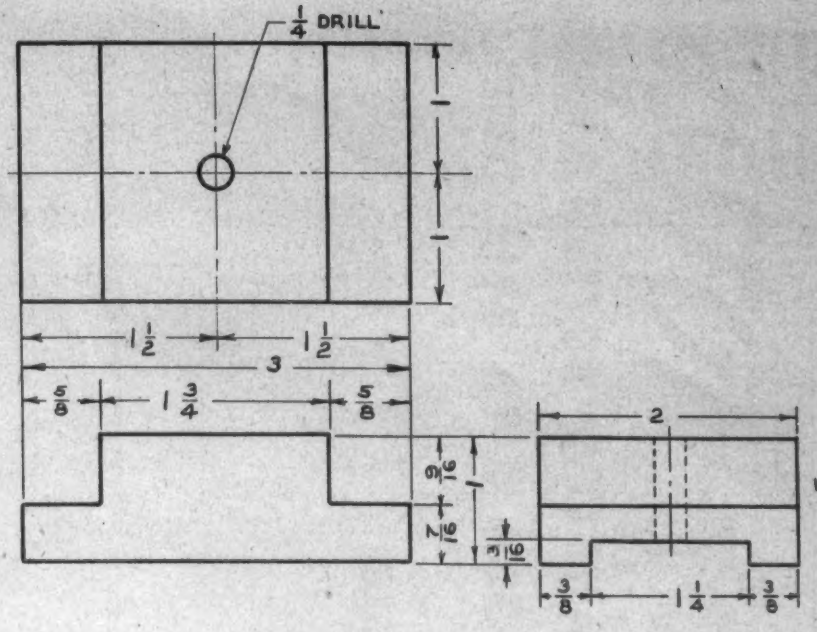
Job 3. Complete the views by drawing in the missing lines. Answer the questions.
Purpose: To show the use of invisible lines.



1. Bottom width of dovetail groove = _____
2. Top width of dovetail groove = _____
3. Length of dovetail groove = _____
4. Depth of dovetail groove = _____

Your Name Date Completed

Job 4. Complete the views by drawing in the missing lines. Answer the questions.
Purpose: To show the use of invisible lines.

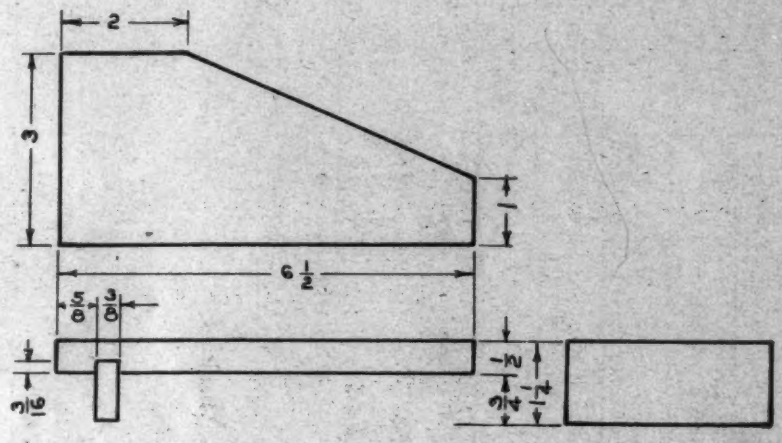


1. Length of groove = _____
2. Width of groove = _____
3. Depth of groove = _____

Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Hammond, Ind. (See article on page 326)

Job 5. Complete the views by drawing in the missing lines. Answer the questions.
Purpose: To teach the use of visible and invisible object lines.



1. Thickness of stock = _____
2. Depth of groove = _____
3. Width of groove = _____
4. Length of groove = _____

Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Hammond, Ind.
(See article on page 326)

CO-OPERATIVE COMMERCIAL ART

(Continued from page 326)

mercial work, and distributive occupations. Perhaps a description of a co-operative program in commercial art recently inaugurated by Cass Technical High School with the Chrysler Corporation (Dodge Division) may stimulate further discussion and activity.

Cass Technical High School basically is *not* a "co-operative program" school. Only a very few pupils are enrolled in a co-operative program. Under ordinary circumstances pupils desiring such a program enroll in other trade, vocational, or commercial schools which emphasize such programs. However, commercial art, one of the 18 different curriculums at Cass Technical High School, has no counterpart in any other school. Opportunity has recently been provided to a few carefully selected senior commercial-art pupils to enroll *co-operatives* through arrangements with the visual aid department of the Dodge Division of the Chrysler Corporation.

These pupils work in *pairs* on an alternate two weeks' basis. Enrollment is based on selection by the school and the corporation. The school selection criteria includes an evaluation of the interest and aptitude of the commercial-art student in industrial commercial art rather than, for example, in costume design and illustration. A carefully established sequence of operations from *lettering* through *airbrush* was first mutually agreed upon. The basic interest of the *corporation* in educational values has made this co-operation so effective that it is possible to arrange programs so that the standards of the North Central Association can be maintained. The high school diploma, therefore, is acceptable as *college entrance* just as are all Cass diplomas.

Recently the *co-op* group have completed a series of 92 plates in the Dodge plant. These plates are in full color, approximately 20 by 30 in., and have been commercially photographed in full color as a 16mm. slide film strip on industrial safety. This slide film will be used throughout the corporation as an integral part of its safety program. Included in the 92 frames are some of a *general safety* nature, some primarily lettered instructions or precautions, some of the *cartoon* type with caricatures and exaggerations. Basically, however, they are full-colored copies of actual *on-the-job* situations. There are a series on *hand tools, the lathe, the milling machine, the shaper,* etc. They were drawn by the commercial art *co-ops* by direct observation in the Chrysler shops of the particular machine.

In some safety situations several of the art co-ops were simultaneously commissioned to illustrate the point. Their sketch ideas are then reviewed by the Chrysler staff and freely criticized. This practical criticism has proved to be an instructional by-product of very real value even though unexpected. The more obvious educational values over and above those inherent in the art phase of the program arise from the intimate familiarity of art students with a highly industrial and highly practical situation. In the various projects there are other instructional values corresponding to this real instructional program in safety.

The art work has been of such high caliber that the original panels are now on exhibit at the Detroit Institute of Art. The Chrysler Corporation has graciously made the safety slide film, which carries no advertising, available for the use of the Detroit public schools in their safety program.

This program has really been a *co-operative* educational program in every best sense of the word.

Personal News

JOHN C. WRIGHT RETIRES

After a half-century of service to American education, 29 years of which were spent with the Federal Board for Vocational Education and the U. S. Office of Education, Dr. John C. Wright, assistant commissioner for vocational education, retired to private life on June 30, 1946.

(Continued on page 22A)

DISSTON TOOLS

ASSURE BETTER WORKMANSHIP, LONG LIFE AND ECONOMY

Ever since the days when vocational training first became a major factor in the education of American youth, the importance of fine quality tools for student use was emphasized by Manual Training Instructors.

Experience through the years has proved them correct. It has shown that students take greater interest in their work and progress faster when they are supplied with high quality tools. Students enjoy working with Disston saws. Instructors, too, prefer them because they stay sharp longer, stand up better under rough usage and give more years of dependable service.

Your students will find the Disston Saw, Tool and File Manual helpful to them in their work. It tells them how to choose, use and care for tools. Free copies may be obtained from their local hardware retailers, or they may write direct to us.

Educational charts and other useful material for your own use in the classroom, will be sent to you without charge. Write for the complete set.

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A modern Printing Department

is an Essential in a Modern Vocational Program

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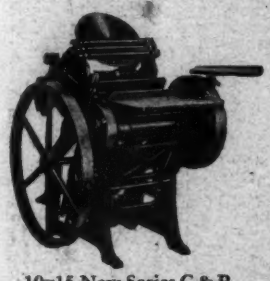
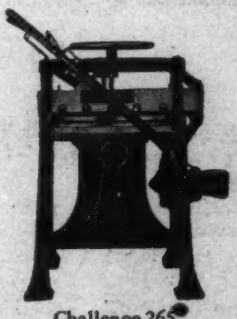


10x15 New Series C & P Platen Press



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American Type Founders

Department of Education

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(Continued from page 330)

He was graduated from the Kansas State Normal School in 1900. For several years he taught in the high schools of Belleville, Kans., and was also superintendent of schools in that city. In 1904 he became instructor in the Central High School, Kansas City, Mo., and was appointed director of vocational and manual training instruction in the Kansas City schools in 1912. In the next five years he organized that city's vocational school system. It was under his administration that the well-known Lathrop School of Mechanical Trades, the Jane Hayes Gates Institute, and the Lincoln High Trade School were organized in the Kansas City schools.

In 1917, when the Federal Board for Vocational Education was organized, Dr. Wright was called to Washington and was associated with the new organization as Field Agent, Chief of the Trade and Industrial Service. He later served for 12 years as director. In 1933 when the functions of the Board were transferred to the Office of Education, Dr. Wright was named Assistant U. S. Commissioner in charge of vocational education.

Dr. J. C. Wright

During his service with the Federal Board and the U. S. Office of Education Dr. Wright was associated with surveys concerned with vocational education programs not only in this country but also in Canada, Hawaii, Puerto Rico, Mexico, the Canal Zone, and Central and South America. In 1924 he directed a survey of the industries and public schools in the Hawaiian Islands for the purpose of making recommendations on the desirability of requesting Congress to extend the benefits of federal appropriations for vocational education to the Islands. In 1940, just prior to World War II, he again visited Hawaii to evaluate the effectiveness of the training programs.

The Secretary of State honored Dr. Wright in 1934 by naming him chairman of the United States delegation to the second Inter-American Conference on Education, held in Santiago, Chile, in September of that year. Delegates from 18 of the 21 republics in the Western Hemisphere attended.

In January, 1936, Dr. Wright visited the Canal Zone at the request of Governor J. L. Schley to make a survey of the need for an apprenticeship program in connection with occupations concerned with the maintenance of the Panama Canal. Again, in 1946, he was invited by Acting Governor F. K. Newcomer to revisit the Canal Zone to survey the situation regarding training facilities for Negroes.

In 1941 he represented the United States at a conference in Mexico City, which was attended by outstanding educators from the republics of the Pan American Union, and was chairman of several important committees during the conference. At the request of the Mexican Minister of Education, he headed a group which surveyed the vocational training facilities of Mexico City, and made recommendations regarding further expansion.

From the passage of the Smith-Hughes Act in 1917 to the present time, Dr. Wright has seen the enrollment in federally aided vocational training programs increase from approximately 100,000 to 2,500,000 persons.

In commenting on Dr. Wright's retirement, U. S. Commissioner of Education John W. Studebaker said:

"Dr. Wright's contribution to the progress of vocational education in this country cannot be summed up in mere words. It would be difficult to say just what progress vocational education would have made had it not been for the faith, the enthusiasm, and the tireless energy of this one man."

After teaching during the summer session at Pennsylvania State College, Dr. Wright plans to lecture and write on the general subject of vocational education.

Dr. Raymond W. Gregory has been named as Dr. Wright's successor.

AUGUSTUS ROSE DIES

Augustus Foster Rose, dean of the Rhode Island art teachers, died at his home in Providence, R. I., at the age of 73 on July 21, 1946.

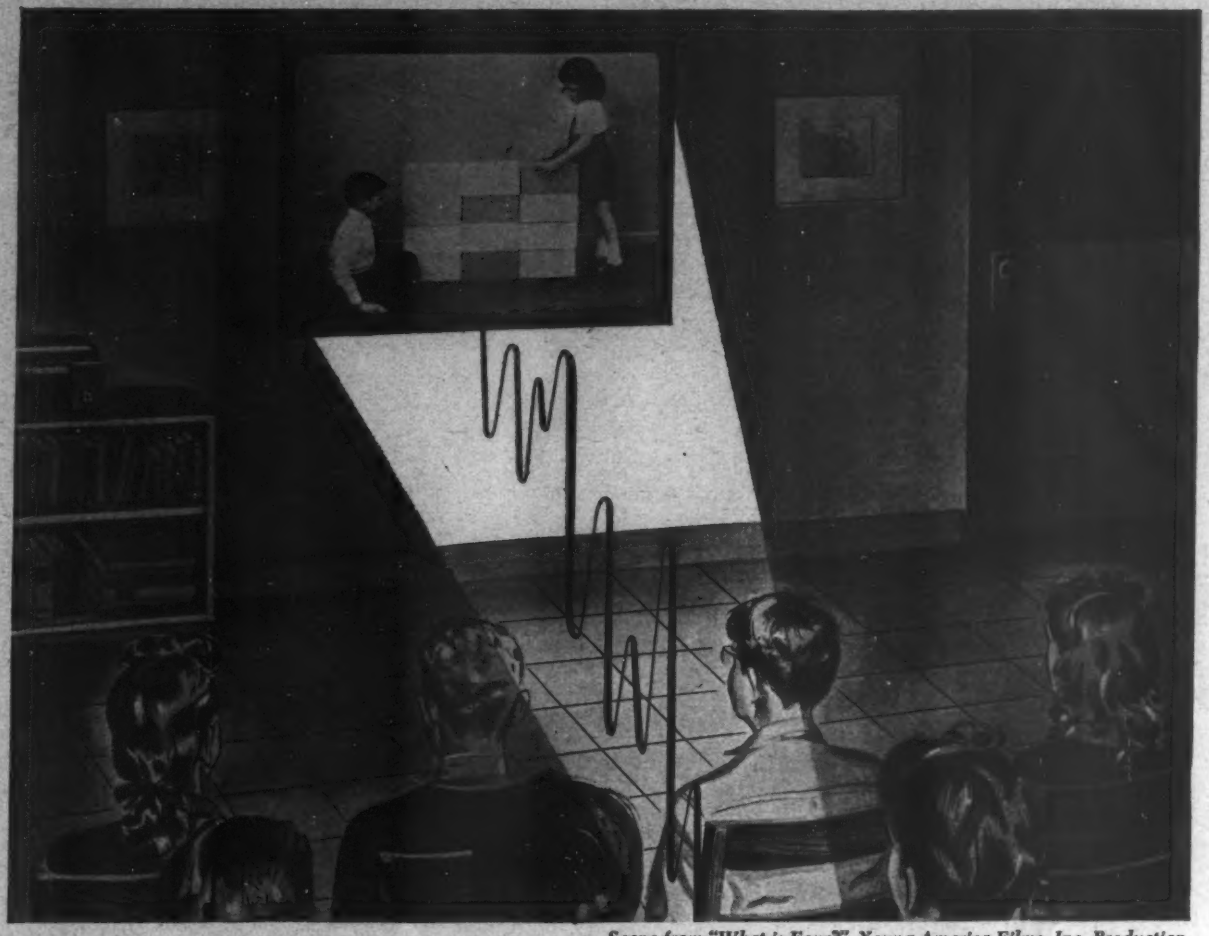
He was born in Hebron, N. S., and attended the elementary school there. Later he came to New England to study, and was graduated from the Massachusetts Normal Art School, Boston, in 1896. He attended other New England universities for special courses, and in 1902 he went to London to take up the study of pottery and enameling. On his return he taught manual arts at Boston. In 1911 he returned to the Providence school system, and from 1925, until he retired in 1943 he was director of the manual-arts department at that city. He was also the director of the normal art and jewelry and silversmithing department at Rhode Island School of Design.

In 1919 he was appointed United States Commissioner of Rehabilitation and many veterans of World War I received rehabilitation training in jewelry work under his supervision.

He is the author of several textbooks on jewelry making and designing, and his book on *Copper Work* ran through eight editions.

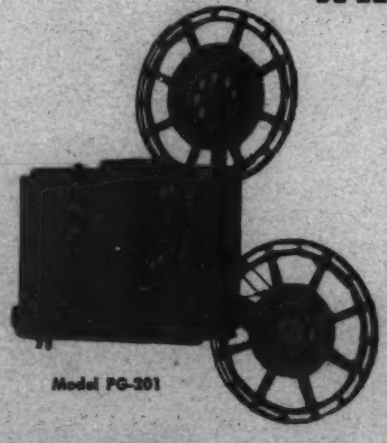
He is survived by his widow and two daughters.

(Continued on page 24A)



Scene from "What is Four?", Young America Films, Inc. Production.

Something different happens when teachers use SOUND FILMS



Model PG-201

WHEN scholastic studies can be looked at and listened to simultaneously something happens to students that increases the capacity of their minds for learning. Students learn more efficiently, more understandingly.

Sound motion pictures enable students to see and hear the lesson on the projection screen—causing concepts to grow and knowledge to be acquired more quickly and retained longer.

With an RCA 16 mm Sound Film Projector, you get the utmost advantages from sound films as a valuable teaching aid. The silvered pyrex reflector, large condenser lens and F 1.6 "coated" projector lens provide brilliant reproduction of black-and-white or full-color scenes in true photographic tones, in unequalled contrast and clarity. A powerful four-stage amplifier and a precision-engineered mechanical filter provide sound reproduction of narration, music or sound effect, with all the fidelity of the original.

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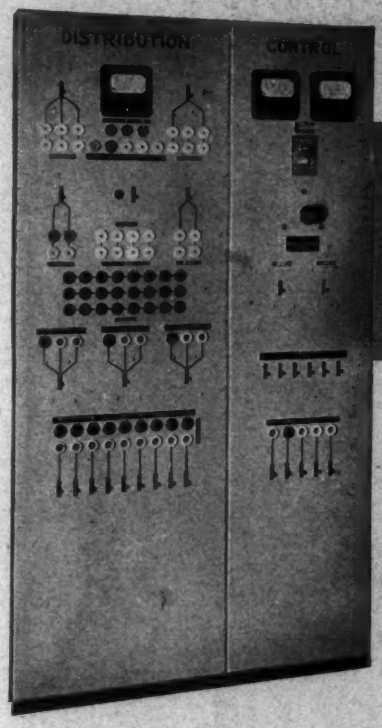
RCA

EDUCATIONAL DEPARTMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal



TAKE IT FROM HERE!

● Yes, that's what you do when power supplies are distributed and controlled by a Standard Electric Time Company panel system.

Laboratory panels for electrical shops in high or trade schools and colleges perform an important function in any vocational or manual arts training program. This is especially true because throughout industry similar Standard panels are in use for laboratory and testing operations. Thus there is a definite carryover value of school shop training into actual industrial practice later.

Every Standard panel is designed and built after a study of individual needs and circumstances — a custom-tailored job from start to finish.

We shall gladly have a nearby field man call on you if you will but write us mentioning this publication.

THE STANDARD ELECTRIC TIME CO., SPRINGFIELD 2, MASS.
Founded 1884

(Continued from page 22A)

♦ HAL GILKER was appointed assistant to the director of The David Ranken School of Mechanical Trades, St. Louis, Mo., on May 6. He received the bachelor of science degree at The Stout Institute, Menomonie, Wis., in 1935, and in 1937 he was awarded the master of arts degree at the University of Minnesota. During the war and before entering the service he served as an instructor trainer for the War Department at Fort Knox, Ky., and as Chief Training Adviser in Transport Personnel, Office of Defense Transportation, Washington, D. C. He has been an instructor in shop work as well as related subjects, and has conducted a number of series of foremen training conferences and safety conferences. As a member of the staff of the Green Bay, Wis., School of Adult and Vocational Education, he supervised evening school instruction. Immediately prior to the war he directed the vocational education program of the Waterloo, Iowa, East Independent School District. He has worked in a number of positions in industry, and for five years was a supervisor in the Nash Automobile factories at Milwaukee and Racine, Wis.

♦ WILLIAM C. ASH, director of vocational teacher education in the School of Education, University of Pennsylvania, Philadelphia, Pa., since 1918, retired as professor emeritus of vocational education in June, 1946. He was given the following citation by his colleagues.

"Able administrator, wise teacher and counselor, pioneer in the field of vocational education and vocational teacher education, your colleagues in the department of education cite you for a lifetime of service to your learners and the communities in which they work, to the school of education which you have helped to build and to your alma mater the University of Pennsylvania."

♦ FRANCIS M. GARVER, who came in 1923 to organize the University of Pennsylvania's division of elementary education and later to direct the reading clinic, retired as professor emeritus of elementary education in June, 1946. He was given the following citation by his colleagues:

"Independent thinker, stimulating teacher, discerning counselor, your colleagues in the department of education cite you for devoted and fearless service to the profession of teaching, to the cause of childhood education, and to those agencies and movements which have been fortunate enough to receive benefit of your versatile talent."

R. C. WENRICH APPOINTED DIRECTOR

Ralph C. Wenrich, of the industrial teacher training staff of the University of Michigan, Ann Arbor, Mich., has been appointed director

Ralph C. Wenrich

of the State Board of Control for Vocational Education, Lansing, Mich. In this position he also will have the status of deputy superintendent of public instruction.

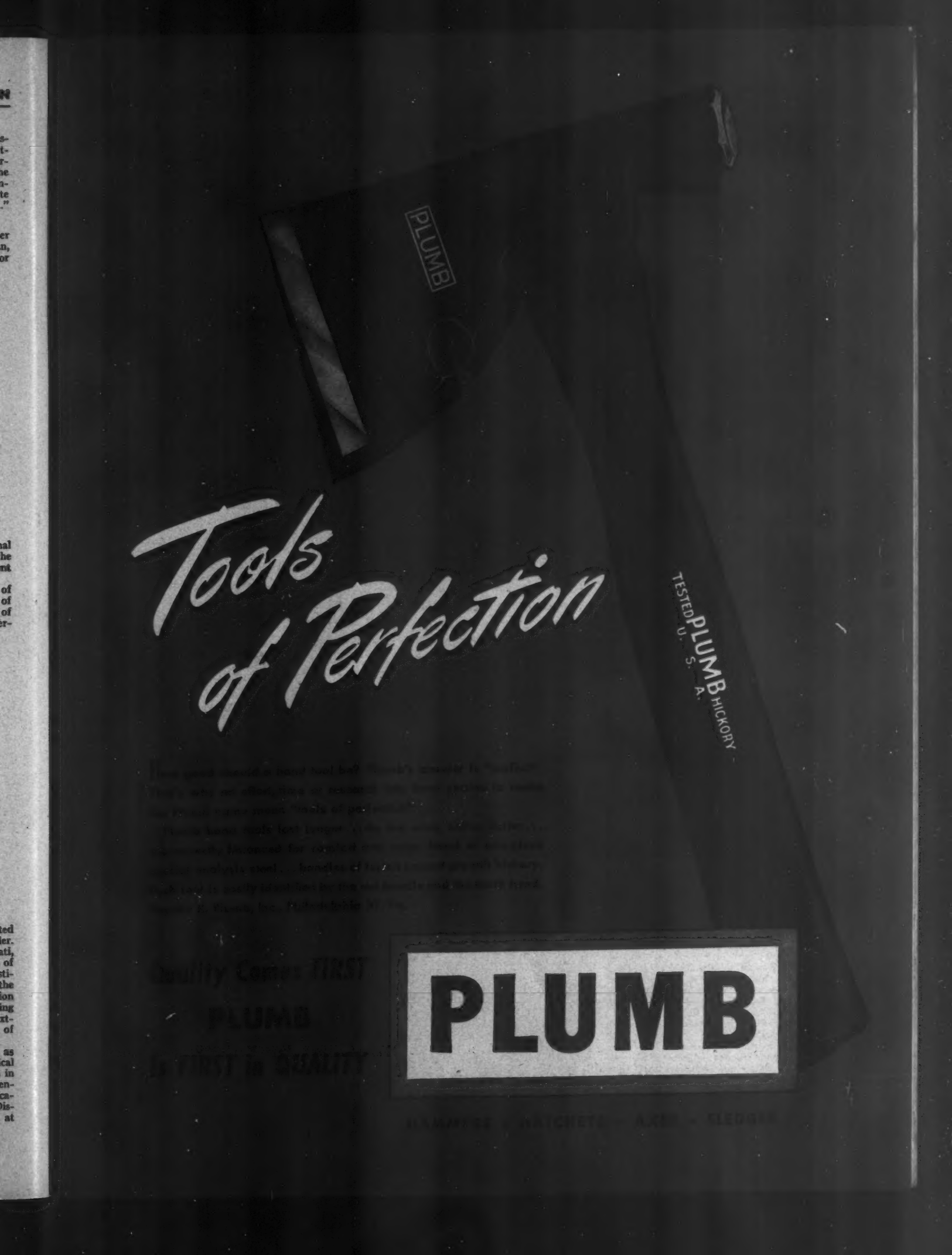
♦ R. RANDOLPH KARCH, formerly principal of the High School of Graphic Arts and Printing of Cincinnati, Ohio, has been appointed director of typography and advertising manager of Intertype Corporation.

R. Randolph Karch

He was separated recently from the United States Naval Reserve as a lieutenant commander. Prior to his position as principal in Cincinnati, Mr. Karch was supervisor of the Department of Publishing and Printing at the Rochester Institute of Technology, and for two years held the position of chairman of the research commission of the International Association of Printing House Craftsmen. He is well known for his textbooks and magazine contributions in the field of education and graphic arts.

Mr. Karch served the navy in Chicago as officer-in-charge of publications, wrote technical printing specifications for naval aviation books in New York, served on the admiral's staff in Pensacola, Fla., as printing adviser, and was publications control officer for the Fourth Naval District in Philadelphia. He will now be located at

(Continued on page 26A)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Tools of Perfection
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Quality Comes FIRST
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Is FIRST in QUALITY
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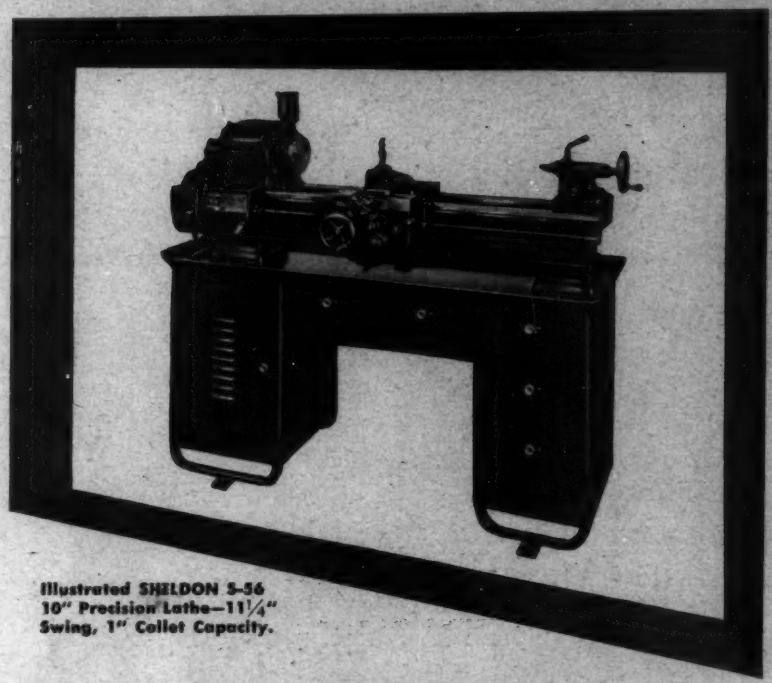

Illustrated SHELDON S-56
10" Precision Lathe—11¼"
Swing, 1" Collet Capacity.

Have you seen the new **SHELDON** Lathes..

. . . those built in the new SHELDON machine tool plant? Always good lathes, these new SHELDONS are even better, not only in design refinements but in extreme accuracy, greater work capacity for size, "sweeter" handling and actual beauty of finish. Only a set-up like the new SHELDON plant could build such lathes—a specially designed building, the most modern manufacturing methods, complete tooling with row on row of the finest, most modern manufacturing equipment.

Make it a point to stop in at your SHELDON dealer's and see these new machine tools. Note their moderate prices. They are a revelation of what modern equipment and methods produce.

WRITE FOR CATALOG

SHELDON MACHINE CO. Inc.

(Continued from page 24A)

the Intertype plant in Brooklyn, where he will manage the printing department in addition to his other duties.

♦ Lt. Com. Homer C. Rose, U.S.N.R., has been released to inactive duty as a naval officer in order to accept a civil service position as Head, Curriculum and Instruction Section, Bureau of Naval Personnel, Washington, D. C.

He and his staff will write curricula, and train instructors for navy schools.

As a naval officer, Commander Rose had charge of instructor training programs at a number of training centers, primarily connected with amphibious training.

Prior to joining the armed forces in 1943 Commander Rose was a member of the Instructor Training staff under Col. Verne C. Fryklund at Fort Knox, Ky. He is a graduate of The Stout Institute, Menomonie, Wis., and holds the master's degree in industrial education from Iowa State College. He has held teaching positions in Augusta, Wis., West Allis, Wis., and Carbondale, Ill., and has written numerous articles in the fields of industrial education.

♦ The following veterans have returned to teaching in Cleveland, Ohio: Dudley Damon as woodwork instructor at Rawlings Junior High School. John C. Gravens teaches mechanical drawing at West Tech. Albert Haessly has been appointed instructor of printing at Empire Junior High School. Joseph M. Haney has joined the teaching staff at Orchard School. W. P. Hoffman has returned to teach printing at Wilbur Wright. Howard Haut teaches printing at the Willson Junior High School. C. J. Kolczynski teaches blueprint reading and shop theory at Edison School. Nick A. Lalich has been appointed teacher of woodwork at Kennard Junior High School. James A. Marino has been assigned to teach general metalwork and mechanical drawing at the Myron T. Herrick Junior High School. J. C. Neff is now teaching woodwork at Lincoln High School. He also is in charge of the school's visual aids. Clyde Newell is teaching blueprinting, metalwork, and household mechanics at Lincoln High School. Nick C. Ribich has been appointed printing instructor at Nathan Hale. Richard W. Rueter has been appointed co-ordinator of veterans' affairs at the Cleveland Trade School. Merril D. Spurrier has been made instructor of special refrigeration courses for G.I.'s at East Tech.

♦ J. R. H. Moore, for 35 years (1909–44) head of the history department of Emmerich Manual Training High School died May 13, two days after the funeral services for his wife. Mr. Moore had degrees from Boston and Harvard Universities, was a veteran of the Spanish American and World War I, and was a member of college summer staffs, for many years. He enjoyed a wide reputation as historian, author, and educator.

♦ E. N. Wright, teacher of agriculture at Mound Cinty, Mo., has been elected mayor of his community.

♦ Homer T. Ragle, formerly assistant state supervisor of trade and industrial education, has been appointed director of vocational education of the public schools of Springfield, Mo.

♦ Ammon Swope, professor of trade and industrial education, taught graduate courses in adult education, history of industrial education, and principles of industrial teaching at the summer session of the University of Missouri, Columbia, Mo.

♦ Jesse Alderman Taft, formerly head of the agricultural department, Barnstable High School, Hyannis, Mass., has been appointed supervisor in education in agriculture for Massachusetts. He succeeds Franklin E. Heald who retired.

♦ James W. Frick formerly teacher co-ordinator of distributive education at Gowanda High School, New York City, has been appointed to a position with the U. S. Bureau of Internal Revenue.

♦ Albert Jochen, assistant director of the Middlesex County Vocational Schools, New Brunswick, N. J., was elected president of the New Jersey Section of the A.V.A. at Atlantic City, March 16.

♦ Franklin E. Heald, supervisor in education in agriculture in Massachusetts, has retired. He had been supervisor of teacher training in agriculture from 1918 until he reached retirement age in 1943. He continued on an emergency basis during the war.

♦ Brice H. Sewell, supervisor of trade and industrial education in New Mexico, has returned to the job after three years in the navy.

♦ Clarence Brown Davenport who has taught vocational agriculture at the Rancocas Regional High School, Mt. Holly, N. J., for 25 years was tendered a testimonial dinner by his former students. He was presented with a gold watch by the alumni group, and the New Jersey Agricultural Society conferred a medal for meritorious service on him. He also received the 25-year vocational agriculture service key.

♦ E. B. Norton, Alabama State Superintendent of Education, has been appointed director of school administration in the U. S. Office of Education.

♦ The following have been added to the faculty of The David Ranken Jr. School of Mechanical Trades, St. Louis, Mo.: Chester B. Curry, refrigeration; John F. Gilligan, refrigeration; Roy N. Riese, mathematics; D. E. Loveall, mechanical drawing; C. P. Dunlap, English and mathematics; Clyde F. Mabry, refrigeration; W. O. Custer, electricity; Charles O. May, air conditioning; R. H. Goodwin, auto mechanics.

♦ Donald K. Beckley formerly at the Rochester Institute of Technology, Rochester, N. Y., has been appointed director of the Prince School of Retailing, Simmons College, Boston, Mass.

♦ C. N. Waffen has been assigned to the physical education department, West High School, Cleveland, Ohio.

♦ Charles S. Whittier has been assigned to teach printing at the Alexander Hamilton Junior High School, Cleveland, Ohio.

(Continued on page 29A)

G-E Science Shorts

ON SUBJECTS YOUR STUDENTS WILL ASK YOU ABOUT

PROPJET

G-E PROPJET combines both propeller and jet power. In this engine air rams into the nose of the Propjet through ducts opening forward. This air is compressed by axial flow units in the forward part of the engine and then forced into combustion chambers. There fuel is injected and burns intensely. This raises the temperature and velocity of the gases, which then, with great energy, strike the buckets of the turbine wheel. The turbine, spinning more than 10,000 times a minute at a temperature over 1500 degrees Fahrenheit absorbs the major part of the energy in the gases.

The turbine powers the compressor and through reduction gears drives the propeller. Reactive thrust created by the energy remaining in the gases passing through the turbine wheel and discharging rearward is utilized in jet propulsion.

Newest of aviation power plants is the G-E Propjet—here on a test stand.

INTERESTING FACTS ABOUT THE PROPJET:

This gas turbine, long and streamlined, is relatively light. Smaller, lighter engines mean an increase in carrying load at greater range.

It is simple. It is a compact power plant in which the power is developed in a single high-speed rotor, spinning many thousands of times a minute.

Its engine vibration is slight—there is virtually no vibration at maximum power.

The Propjet gas turbine functions most efficiently when producing full power continuously during long flights and when flying at high altitudes.

It operates efficiently on virtually any liquid fuel. Kerosene has been used for the actual test flights so far.

THE GAS TURBINE with propeller is designed for installation in multi-engined aircraft or in the nose of a single-engine plane. The power generated by these new units as demonstrated by the XP-81, is great; great enough to drive the projected mammoth planes of the future.

Consolidated Vultee XP-81—powered by G-E Propjet and G-E Jet engine.

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GENERAL ELECTRIC

New 1946 Berg and Krongnist

MECHANICAL DRAWING PROBLEMS

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A—Problems have been redrawn and changed for better learning technique and to conform with American Standards throughout, yet it is still the same shrewdly arranged, fast-action textbook, for a full beginning course in mechanical drawing. More instruction worked into the plan. Projects remain the basis of the course, but the instruction idea behind each one has been played up and the project idea, as such, de-emphasized.

Includes study of all essential points in linework, picture drawing, projection, making working drawings, pattern development, machine drafting, and making an architectural plan. Be sure to order on-approval. Of great interest just to look through. Size 8 x 6 inches, **no price change: cloth, $1.76; paper, $1.20** —less 25% discount on quantities of 5 or more.

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B—First on-approval copies sent out just before close of school last spring brought in such statements as, "a real text for the industrial-arts level." All principles illustrated with photographs; numerous jobs and extra 'jobs, problem suggestions. Attractive to the boy in every way. **Cloth, $2.20**—less 25% discount on quantities of 5 or more.

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C—WOODWORKING WORKBOOK—Nichols and Stiles. Acknowledged leader in its class—thorough, economical, fast-action work-book-textbook. Paper, 56c—5 or more, only 42c ea.

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City, Zone and State .....

School and Position .....

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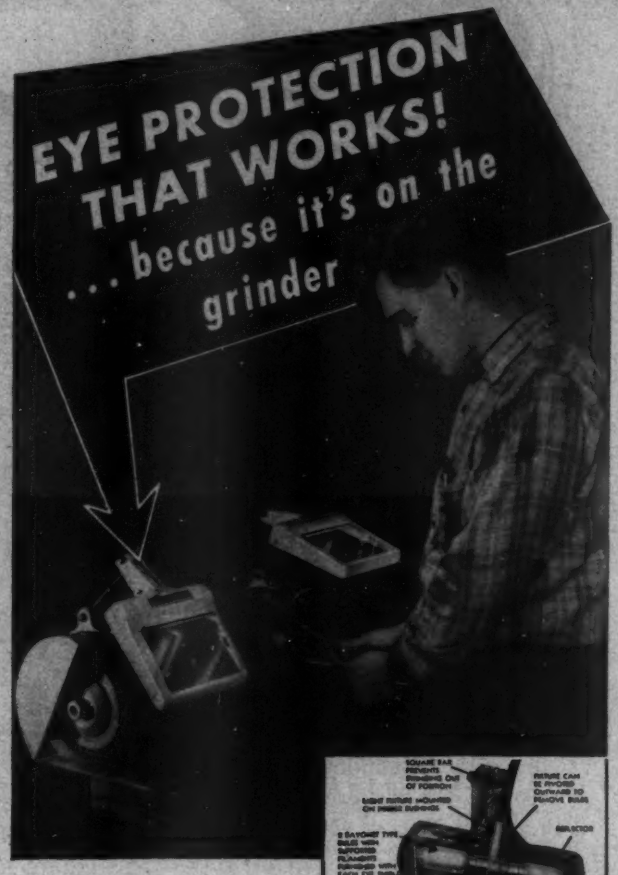

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Gentlemen: Please send full details on Stanley "Flud-Lite" Eye Shields.

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School.....

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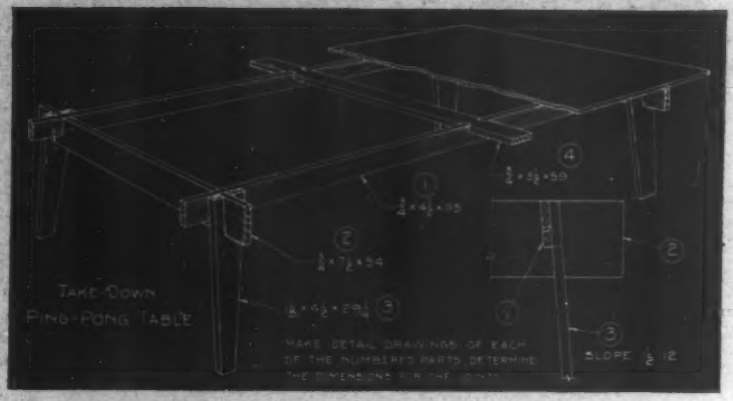
As you know, Dixon has broadened the scope of Eldorado's Problem-and-Solution Service. Now we send the instructor an Eldoradostat—a transparency of the solution from which an unlimited number of blueprints can be made. We also furnish a transparency of the problem for blueprinting.

N.B. Plans are in the making to extend this service. Look for announcement later. This announcement will be sent to all on our mailing list.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MAKE DETAIL DRAWINGS OF EACH OF THE NUMBERED PARTS. DETERMINE THE DIMENSIONS FOR THE JOINTS
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(Continued from page 26A)

♦ EMMETT O'BRIEN, New Haven, Conn., has been appointed director of vocational education for the state of Connecticut. He succeeds A. S. Boynton who retired January 1, 1946.

Mr. O'Brien is a graduate of Yale and has done graduate work there and at New York University.

♦ SHERMAN DICKINSON, Ph.D., professor of education, College of Agriculture, University of Missouri, resigns after teaching for 32 years. He received a B.S. degree from Iowa State College, and the M.S. and Ph.D. degrees from the University of Minnesota.

Dr. Dickinson is the author of four textbooks, a number of bulletins and many magazine articles.

♦ EDWARD H. LANG, formerly supervisor of industrial education, State Education Department, Albany, N. Y., has been appointed principal of the Technical and Industrial High School, Syracuse, N. Y.

♦ SAM F. HALL, Clayton, Mo., was a member of the summer school educational workshop staff at Washington University, St. Louis, assisting in arts and crafts.

♦ ROBERT STRICKLAND, who has been vocal instructor at Fremont, Neb., Senior High School for the greater portion of the school year, has resigned to accept a position as superintendent of schools at Clarks, Neb.

Under Mr. Strickland's able direction the a cappella choir has participated in numerous programs, and has a large repertoire of selections.

As yet, the vacancy made by this resignation has not been filled.

♦ JAMES E. REAGAN, teacher in the industrial-arts department of John Adams High School, Cleveland, Ohio, since its opening in September, 1923, died March 2 at Cleveland Clinic Hospital, after a short illness.

Mr. Reagan's success in the field of metalwork was outstanding. He pioneered in the field of metal spinning in the Cleveland schools, and was the author of two books on this subject. He was a member of Epsilon Pi Tau, honorary Industrial-Arts Teachers' fraternity.

Mr. Reagan is survived by his wife and daughter.

♦ JOHN J. SCHIELY, teacher of woodworking in the public school system of Cleveland, Ohio, died recently. He served at Outhwaite and at Thomas Edison Schools, directing the work of cabinet making.

♦ HUGH L. OAKLEY, formerly with the Lexington, Ky., public schools and now a graduate student in the University of Missouri, is to be head of the Department of Industrial Education at the Murray State College, Murray, Ky. Mr. Oakley was graduated from the Western Kentucky State Teachers College with a major in industrial education. During the war, he served as a Lt. Commander in the navy in charge of the basic training program at the Navy Pier, Chicago, and later was placed in charge of ten line maintenance schools at the Navy Air Base, Memphis, Tenn. He is to organize a new program with a new building and equipment at the Murray State College.

♦ RALPH NAIR, on leave from Santa Barbara State Teachers College, Santa Barbara, Calif., is working on his doctor's degree in industrial education at the University of Missouri. During the war, Mr. Nair served as an instructor and industrial engineer with the aircraft industry on the west coast. He will return to Santa Barbara in September.

♦ FRED C. FINSTERBACH, formerly instructor of the Industrial Arts Laboratory at School 18, Buffalo, N. Y., has been appointed instructor of the general shop at State Teachers College, Buffalo, N. Y.

♦ MAJOR FRANK D. DOLAN has again assumed civilian status but he will continue as assistant to the Director of Training, Ordnance School, Aberdeen Proving Ground, Md.

♦ CAPT. HAROLD A. SCHULTZ has returned to civilian life. He will however continue in his former job as Chief of the Training Standards Branch of the Ordnance School, Aberdeen Proving Ground, Md.

♦ WILLARD GRAY, superintendent of schools, Independence, Kans., has been appointed administrative dean at Southwest Missouri State Teachers College, Springfield, Mo.

♦ E. R. STEVENS has been made superintendent of schools at Independence, Kans.

♦ GEORGE J. FREY, after finishing two and one-half years in the army, has returned to the staff of the State Board for Vocational Education, Topeka, Kans.

♦ JOHN T. BRISCOE, industrial-arts instructor at the Lyons High School, Lyons, Ind., was honored with a certificate of merit from the Indiana Industrial Education Association.

Association News

EPSILON PI TAU CONFERENCE

The first national conference of Epsilon Pi Tau since the outbreak of the war was held on May 10, in the Oak Park Arms Hotel, Oak Park, Ill. This meeting, representing 17 years of professional stimulation and progress on the part of the fraternity was a continuation of its policy to have programs in conjunction with professional associations in the field. The Oak Park conference was held at the time of the annual meeting of the American Industrial Arts Association.

The fraternity's conference consisted of an initiation and banquet program. Twenty-four persons, both students and teachers of industrial arts and industrial vocational education, to be initiated at the conference were among the two hundred new members of Epsilon Pi Tau this spring. The national initiating team consisted of Professor O. E. Sink, chairman, Department of Industrial Arts Education, Ball State Teachers College, Muncie, Ind.; Dr. Louis J. Newkirk, director of industrial arts, Board of Education,

(Continued on next page)

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STARRETT EDUCATIONAL SETS have become standard equipment in hundreds of Manual Training schools. The set consists of fourteen blueprinted student notebook pages each showing a different tool and how to use it. Furnished at cost—10 cents per set.

In every class you'll find students who thrive on difficult and exacting problems. For them you want the sure accuracy and efficiency of STARRETT TOOLS. And then there are the lads with whom use is mighty close to abuse. For them you want the sturdy design and quality materials in STARRETT TOOLS—the design and materials that help them hold their unfailing accuracy year after year.

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World's Greatest Toolmakers

STARRETT TOOLS
Precision Tools • Dial Indicators • Ground Flat Stock • Hacksaws • Metal and Wood Cutting Band Saws • Steel Tapes

(Continued from previous page)

Chicago, Ill.; Dr. William D. Stoner, chairman, Department of Industrial Arts Education, Miami University, Oxford, Ohio; Professor Harold G. Palmer, chairman, Department of Arts, State Teachers College, Cedar Falls, Iowa; Dr. Walter A. Klehm, chairman, Department of Industrial Arts Education, State Teachers College, Charleston, Ill.; Professor A. H. Luehring, Department of Industrial Arts Education, State Teachers College, Terre Haute, Ind.; Robert J. Wolf, State Teachers College, Buffalo, N. Y.; and Lt. Col. William E. Warner, executive secretary of Epsilon Pi Tau, on military leave.

Professor Paul E. Harrison, State Teachers College, DeKalb, Ill.; was in charge of student examinations. Others who participated were Professor Coleman Hewitt, Chicago Teachers College, Chicago, Ill.; Professor Lawrence Secrist, State Teachers College, DeKalb, Ill., in charge of the oral examination; Professor Anthony T. Stavaski, State Teachers College, California, Pa.; and Professor Willis A. Whitehead, Bureau of Educational Research, the Ohio State University, Columbus, Ohio.

The theme of the banquet program was, "The Contribution of Epsilon Pi Tau as the Profession Moves Forward." Dr. John A. Whitesel, acting national secretary of the fraternity, and chairman in charge of the conference program acted as toastmaster. Guests of the evening were introduced by Professor Paul E. Harrison, member of the executive committee. Professor O. E. Sink, president of the board of trustees, extended greetings to the members of the fraternity.

One of the addresses of the program was given by Professor John J. Hatch, director of Industrial Arts Education, State Teachers College, Newark, N. J., and member of the executive committee of the fraternity. The title of his address was, "A Perspective of Professional Progress." Lt. Col. William E. Warner then addressed the group on the topic, "An Analysis of Trends Affecting the Future of Our Profession and What Members of an Honors Group Should Be Doing About It." A lively and informal discussion of professional problems followed. It was participated in by Dr. Eugene Youngert, superintendent, Oak Park-River Forest Township High School; Dr. William D. Stoner, chairman, Department of Industrial Arts Education, Miami University; Dr. Louis V. Newkirk, director of Industrial Arts, Chicago; and Professor Milo T. Oakland, chairman, Department Industrial Arts Education, State Teachers College, DeKalb; and other members of the fraternity.

A leading feature of the program was the bestowing of honorary membership upon Lt. Col. William E. Warner, executive secretary and founder of the fraternity. The award was presented by Professor O. E. Sink, president of the board of trustees. A letter of recommendation sent in to the national office by Dr. Robert E. Smith of the Ohio State University and long time associate of Dr. Warner was quoted in the program as follows: "It is with pleasure that I recommend bestowing honorary membership in Epsilon Pi Tau on Dr. William E. Warner. It was he who took the initiative in organizing the fraternity and who, throughout the years of its existence, has given unsparingly of his time and effort to broaden the fraternity's sphere of influence and activity and in other respects exercised leadership."

—*John A. Whitesel*, Acting National Secretary

INDUSTRIAL EDUCATION SPRING CONFERENCE RESUMED IN MISSOURI

Discontinued during the war years, the annual spring conference for teachers of industrial education was held at the University of Missouri May 10 and 11. The program, planned jointly by the State Department of Education and the School of Education of the University, consisted of two general and six sectional meetings.

The first sectional meeting for co-ordinators and local supervisors was conducted under the chairmanship of George E. Kohrman, state supervisor of industrial education. F. L. Chambers, co-ordinator, University City, discussed and presented illustrative "Related Instructional Material for the Diversified Occupations Program." Hollis W. Dahlor, co-ordinator, Kansas City, spoke on the subject, "Criteria for Evaluating Part-Time Cooperative Programs." David Berryman, co-ordinator, Poplar Bluff, Mo., discussed the question, "Should the Co-ordinator Sponsor an Organization of Junior Workers in Business and Industry?" Tracy Dale, Field Representative, U. S. Office of Education, Division of Surplus Property, explained the regulations and procedures for obtaining surplus government property. O. H. Day, director of vocational education, Kansas City, Mo., served as chairman of the second sectional meeting, at which time a panel discussion was held on the topic, "Veterans Training Under Public Law 346." Members of the panel were: M. Reed Bass, director, Rankin Trade School, St. Louis; George Blackwell, superintendent of schools, St. Joseph, Mo.; Dr. Thomas A. Brady, vice-president, University of Missouri; Gordon Renfrow, director of veterans education, State Department of Education, Jefferson City, Mo.; and M. D. Thomas, chief, Vocational Rehabilitation, Veterans Administration, St. Louis, Mo.

Dr. H. H. London, University of Missouri, presided at the first general session. The speakers and topics were: Dr. L. G. Townsend, dean, School of Education, "Some Unsolved Problems in Industrial Education"; Dr. Lloyd E. Grimes, assistant state superintendent of schools, "The Implications of Changes in State Administration as They Apply to Vocational Education"; and Dr. Dean M. Schweickhard, Minnesota state commissioner of education, "Industrial Education In World Affairs."

The first industrial arts sectional meeting was held under the chairmanship of Verne L. Pickens, director of practical arts, Kansas City. George E. Kohrman, state supervisor of industrial education spoke on the "Relation of Industrial Arts to Vocational Industrial Education." Dr. Kenneth Bing, head, department of industrial arts, State College, Cape Girardeau, presented the arguments "For and Against the General Shop." Dr. Schweickhard spoke on the topic "The Challenge to Industrial Arts."

(Continued on page 32A)

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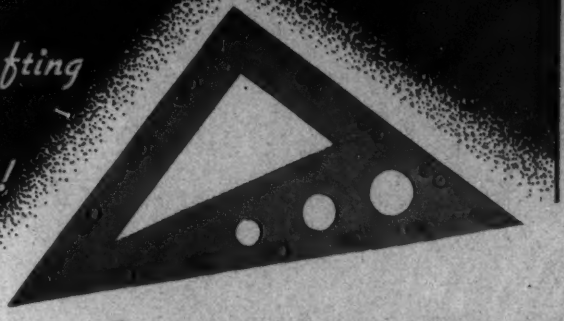

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"INSTRUMASTER" Triangles are machined accurately from clear Vinylite, non-inflamable plastic stock, and are available in unlimited quantities.

"INSTRUMASTER" Triangles actually "float" .020 above the paper by virtue of the embossed buttons on both sides which also provide an ideal fingerlift and prevents smudging of ink and graphite.

Two-in-one-feature. "INSTRUMASTER" actually provides two triangles for the price of one. A 45° cut-out in each 30/60° triangle, and a 30/60° cut-out in each 45° triangle saves, in many instances, the necessity of changing triangles to obtain the desired angle.

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(Continued from page 30A)

Doyle Kemper, state supervisor of industrial arts, presided at the second industrial arts section, which was devoted to a consideration of practical problems. Forest Whitworth, Maplewood-Richmond Heights High School, discussed "Shop Administration and Management." Dr. H. H. London spoke on the "Organization of Instructional Materials" and presented illustrative copies worked out by students at the University of Missouri. Myers Eggert, Kirksville, presented and explained an outline for "A Course in Bench Metal Work." W. B. Attebery, plant manager of the Pittsburgh Glass Company, St. Louis, discussed "Color Dynamics for School Shops."

The first trades and industries section meeting was held under the chairmanship of Glenn E. Smith, state supervisor of occupational information and guidance, at which time a panel discussion was held on the "Selection of Students for Vocational Training." Members of the panel were: R. W. Baker, supervisor of industrial education, Joplin; Walter C. Brown, co-ordinator, Hannibal; Fran McCreery, state supervisor of distributive education; Ed Ralston, principal, Lead Belt Trade School, Bonne Terre; J. Clifton Rook, instructor of auto mechanics, Sprinfield; and M. L. Stewart, co-ordinator, Sikestown.

H. H. Coxen, teacher trainer, Kansas City, presided at the second trades and industries section meeting. At this meeting Carl Walther, instructor of machine shop, Hadley Technical High School, St. Louis, spoke on the "Organization of Instructional Materials for Day Teaching." N. B. Giles, regional agent for trade and industrial education, U. S. Office of Education, discussed "Opportunities and Responsibilities for Foreman Training." As the final speaker, Supt. George D. Englehart of Leadwood addressed the group on "The Area Vocational School."

At the final general session William P. Green, supervisor of vocational education, St. Joseph, presided. State Commissioner Schweickhard addressed the group on the "Integration of Industrial Arts and Vocational-Industrial Education." A letter of greetings and well-wishes from Roy Scantlin, state superintendent and director of vocational education, was read. Afterward, the meeting was turned over to the "Four Horsemen," John Claude of The Bruce Publishing Company, C. A. Roper of the McKnight and McKnight Publishers, Harry W. Sears of the American Technical Society, and Don Jesseman of Stanley Tools, who presented the "ship's prizes."

Officers of the Mu Sigma Pi Graduate Fraternity in Industrial Education at Wayne University, for the school year 1946–47.
Seated left to right: Lewis E. King, corresponding secretary; Gordon E. Rivers, vice-president; Walter H. Jeske, president; Roland Fraser, executive board member.
Standing left to right: Howard A. Brown, treasurer; Charles L. Pozzoni, president of executive board; and Arieus J. Croteau, recording secretary.

♦ O. H. Day, director of vocational education, Kansas City, Mo., addressed the industrial arts and industrial vocational 1946 Annual Spring Conference at Lincoln University on Friday, May 3. The theme of the conference was "Our Place in This Postwar Society." Other speakers included Earl Thomas, principal of R. T. Coles Vocational High School, Kansas City; J. Albert Brocco, field industrial secretary, the Urban League, Kansas City; Leo Stephens, vocational counselor, the Urban League, St. Louis; M. W. G. Sipe, assistant chief, vocational rehabilitation and education division, The Veterans Administration; Dr. A. C. Phillips and Harold Gray of St. Louis; Frank Logan, Columbia; James Bailey, Alton, Ill., and Tracy E. Dale, field representative, U. S. Office of Education.

♦ Co-operative part-time retailing and office training co-ordinators met at Topeka High School May 4. A social gathering was held the preceding evening at the home of Warren Meyer. Co-ordinators on the Saturday program were H. D. Shotwell and Kenneth Meyers of Topeka, Kans.; C. A. Swenson of Hutchinson, Kans.; Nelle West of Wichita, Kans.; and H. C. Palmer of Chanute, Kans. Guest speakers were Frank Long, Shawnee County Welfare Board, luncheon speaker; P. W. Chamnes, director of vocational Education, Topeka, Kans.; Dr. R. R. Pickett, head of Commerce Department, Kansas State Teachers College, Emporia, Kans.; Earl Tregilgus, teacher trainer of Distributive Education; Willard Nuzum, assistant director of the Office of Veterans Affairs; and Perdue Graves, director of the evening school, Topeka, Kans.

Twenty-two administrators, co-ordinators, and future co-ordinators were in attendance.

♦ The National Society for the Prevention of Blindness, 1790 Broadway, New York 19, N. Y., announces that it will hold a three-day confer-

(Continued on page 35A)

These Grade Trade-Marks on Douglas Fir Plywood mean

Quality

kept to Uniform Standards by Rigid Inspection!

THERE is a type and grade of Douglas fir plywood manufactured especially for every building need. Each must meet rigid standards of quality. Current production is constantly inspected . . . constantly tested in the Douglas Fir Plywood Association laboratory. Choose the type and grade for **your** particular job by these "grade trade-marks," which appear on every panel. Use it with complete confidence; its dependability is backed by an industry-wide quality standard.

Substantial Production Now Allocated to Veterans' Housing

Because the needs of the Reconversion Housing program are so acute, Douglas fir plywood is today being allocated by the Civilian Production Administration. This means that a substantial proportion of the Douglas fir plywood industry's current production must go to housing contractors, stock cabinet manufacturers, prefabricators and distributors.

As a result, the supply situation for all other industrial and construction uses is temporarily a difficult one. It is a fact, however, that more plywood is being produced today than in pre-war years. Once the present overwhelming demand has been met, an increased amount will be available for all uses in construction and industry.

Anticipate YOUR needs as far in advance as possible — and discuss those requirements with your regular source of supply.

GENUINE DOUGLAS FIR PLYFORM Concrete Form Panel D.F.P.A. INSPECTED

PLYFORM is the special concrete-form grade of Douglas fir plywood — a quality grade manufactured with highly water-resistant glues and intended for multiple re-use in form construction.

EXT.-D.F.P.A.

EXTERIOR-TYPE plywood is made with completely waterproof synthetic resin binder especially for permanent exposure to weather and water. It is widely used for building exteriors, for outdoor signs, for railroad car siding, and in all phases of marine construction.

GENUINE -PLYSCORD- SHEATHING D.F.P.A. INSPECTED

PLYSCORD is an unsanded utility panel of unusual rigidity, made to withstand the rigorous service demanded of wall and roof sheathing and of sub-flooring.

PLYPANEL D.F.P.A.

PLYPANEL is the grade of interior-type plywood made especially for high quality interior work on walls, ceilings, for booth partitions, cabinet doors and similar uses.

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PLYWALL is the grade of interior-type plywood made for use where only one side is exposed, as in wall paneling. It is suitable for most stained finishes, for painting or papering.

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By R. H. Drake

This text by an experienced teacher presents the background information, full instruction in tools and techniques, and step-by-step shopwork for a course that meets all the CAA requirements for the aircraft mechanic's license in woodwork.
To be ready Sept. 17. Illus. $3.50 (prob.)

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Practical instruction, including the latest methods and materials, in the design, construction and operation of punches and dies, progressing in teachable order from the simplest through those of increasing complexity until all types used for the fabrication of sheet metal have been covered. Illus. $5.

Practical Marine Electricity
By S. N. LeCount and H. S. Dusenbery

A complete course in the electrical fundamentals and the installation, operation and maintenance of every piece of electrical equipment on modern merchant ships. Illus. $3.50

Introduction to Navigation and Nautical Astronomy
By Shute, Shirk, Porter and Hemenway

An outstandingly clear, complete text on both sea and air navigation, written by four successful teachers and checked by Coast Guard and Naval authorities. Many specially drawn illustrations, 400 practical problems, full tables. $4.50

Aircraft Drafting
By H. H. Katz

Written by a man who has trained hundreds of draftsmen for Republic Aviation and Consolidated-Vultee, this book includes much useful information on manufacturing practices as well as full, clear instruction in aircraft drafting techniques. Illus. $5.

Plastic Craft
By Ernest DeWick and J. H. Cooper

Illustrated instruction in the tools and techniques for working plastics, with about 70 projects, ranging in difficulty from the very simplest, and suitable for any type of school or home shop and for work in the art studio. *October,* $4.25 (prob.)

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A complete reference on today's fabrics: their history, each step in their manufacture from raw materials to final finish, their classification, characteristics, standards, etc. Over 700 illustrations, 12 in full color, and an illustrated dictionary of fabrics at the end. *October,* $10. (prob.)

The Craftsman Prepares to Teach
By D. F. Jackey and M. L. Barlow

Simply written, practical directions for planning and conducting all types of vocational courses. A useful handbook for inexperienced teachers. $2.

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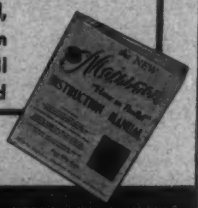

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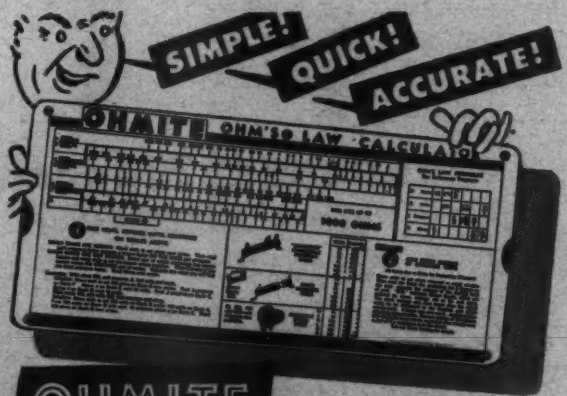

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Solves Any Ohm's Law Problem
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(Continued from page 33A)

ence November 25, 26, and 27, 1946, at the Hotel Pennsylvania, New York City.

♦ A three-day conference was conducted recently in Wichita for trade and industrial instructors by Dr. O. A. Hankammer, Kansas State Teachers College, Pittsburg, Kans., and O. H. Beaty, acting supervisor, Trade and Industrial Education, Topeka, Kans.

The following topics were discussed: Shop Organization and Management; Job Planning and Student Records; Use of Advisory Committees; Professional Growth and Teacher Relationships; Relationship of Vocational Industrial Education, Vocational Technical Education, and Industrial Arts Education; Relation of Shopwork to Related Information.

Two sessions of this conference, organized by J. C. Woodin, director, Vocational and Adult Education, and H. W. McKimmey, head, Industrial Education Department, High School East, were attended by forty instructors, supervisors, and principals. The other sessions were attended by the supervisors and trade and industrial instructors.

COMING CONVENTIONS

♦ *October 7–11.* National Safety Council at Chicago, Ill. R. L. Forney, secretary, 20 W. Wacker Dr., Chicago, Ill. Headquarters, Stevens Hotel, Exhibits in charge of C. H. Miller.

♦ *October 10–11.* Central Missouri Teachers Association at Warrensburg, Mo. Dr. Wm. F. Knox, secretary, State College, Warrensburg, Mo. Headquarters, State College. Exhibits.

♦ *October 10–12.* Utah Education Association at Salt Lake City, Utah. Milton B. Taylor, secretary, 316 Beneficial Life Bldg., Salt Lake City, Utah. Headquarters, Hotel Utah. Exhibits.

♦ *October 23–25.* Maine Teachers Association at Bangor, Me. Clyde Russell, secretary, 14 Western Ave., Augusta, Me. Milford Payson in charge of exhibits.

♦ *October 23–25.* North Dakota Education Association at Fargo, N. Dak. Paul Dalager, secretary, Bismarck, N. Dak. Headquarters, Gardner Hotel.

♦ *October 24–25.* Colorado Education Association at Denver, Pueblo, Grand Junction, Durnago. Craig P. Minear, secretary, 230 Coronado Bldg., Denver 2, Colo.

♦ *October 24–25.* Indiana State Teachers Association at Indianapolis, Ind. Robert H. Tyatt, secretary, 203 Hotel Lincoln, Indianapolis 9, Ind. Headquarters, Hotel Lincoln.

♦ *October 24.* Indiana Vocational Association at Indianapolis, Ind. Glen Barkes, secretary, School Administration Bldg., New Albany, Ind. Headquarters, Arsenal Technical Schools.

♦ *October 24–25.* Minnesota Education Association at Minneapolis, Minn. Walter E. Englund, secretary, 2429 University Ave., St. Paul 4, Minn. Headquarters, Municipal Auditorium.

News Notes

♦ "The number of establishments covered by registered apprenticeship programs in the electrical trade throughout the country has increased since V-J Day from 2336 to 4062 at the end of April, 1946," according to William F. Patterson, Washington, director, Apprentice-Training Service of U. S. Department of Labor.

Mr. Patterson's statement was made at the graduation exercises for electrician apprentices sponsored by the Joint Apprenticeship Committee for the Electrical Industry in New York City at the Building Trades Employers Association, 2 Park Avenue. The committee is composed of an equal number of representatives of the New York Electrical Contractors Association and Local 3 of the International Brotherhood of Electrical Workers.

(Continued on page 42A)

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If you want to be up to date on engine repairs, you'll want your copy of Kerkling & Company's new K & W catalog—and you'll want it fast. There's a big special section with illustrations and diagrams devoted exclusively to the "how" and "why" of the patented K & W Mechanical Method—the efficient, time and money saving way that is guaranteed to restore cracked automotive and diesel engines to unimpaired service.

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PRECISION shop measurement can be learned only by making precision measurements. The day when the micrometer caliper set the metes and bounds of attainable accuracy is past. Its passing was foreshadowed when Ford Motor Company made Johansson Gage Blocks available to all industry in America at moderate cost.

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Now, the gage block is the very cornerstone of precision manufacture. And the "JO-BLOCK," which pioneered millionth-inch accuracy, is the trusted guardian of dimensional exactness in scores of famous factories.

Give your students the opportunity to become familiar with the handling and use of JO-BLOCKS! For about the cost of a good workbench, your school can acquire a minimum working set of genuine JO-BLOCKS at the factory or through any Johansson distributor. Their uncanny cohesiveness and jewel-like surfaces will fascinate the student —instill lasting respect for true accuracy and the vital part it plays in low-cost mass production.

WRITE FOR THESE FREE BOOKLETS

"He Measured in Millionths," an interesting monograph on the achievements of Carl Edvard Johansson, will be useful to you in teaching. Yours for the asking, with the new illustrated Jo-Block Catalog.

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Shop Equipment News

New Products—Publications

DI-ACRO BRAKE NO. 4

The new Di-Acro Brake No. 4 incorporates the following features:

1. Special material clamping action which enables the operator to make extremely sharp bends.
2. Double-edge vertical folding plate permits the making of reverse bends.

Di-Acro brake No. 4

3. Torrington roller bearings increase the speed and ease of operation.
4. A quickly adjustable material gauge assures precision of duplicating.
5. The machine is equipped with angular degree stops.

The Di-Acro Brake No. 4 has a capacity of 16-gauge sheet steel and a maximum forming width of 24 in. It will rapidly form such materials as copper, bronze, stainless steel, aluminum, bimetals, sensitized metals, varnished cambrics, and dielectrics.

A new four-page circular on this brake, and a 40-page catalog covering other models produced by this firm may be obtained gratis by writing to O'Neil-Irwin Manufacturing Co., 351—8th Ave. South, Minneapolis 15, Minn.

For brief reference use IAVE—1610.

INSTRUMASTER HATCHING STENCILS

Time required for cross-hatching is greatly shortened, and neater drawings are produced, by use of the new "Instrumaster" hatching stencils made by Instrumaster Industries, Inc., Greenwich, Conn., and distributed by John R. Cassell Co., Inc., 110 W. 42nd St., New York 18, N. Y.

With these new stencils, hatching is evenly spaced, in less time than when using a triangle.

Instrumaster hatching stencil

Precision markings enable the user to predetermine exact location of the hatching.

The new "Instrumaster" hatching stencil is accurately made from clear, nonwarping, noninflammable plastic stock. Aligning marks and lettering are indelibly debossed. Lines at 30 deg., 45 deg., and 60 deg., to the horizontal can be drawn without a separate triangle. The hatching stencil can also be used as a 75-deg. triangle if desired. It is available in 5 by 6-in., and 6 by 8-in. sizes

For brief reference use IAVE—1611.

METAL CUTTING SLIDE RULE

A metal cutting slide rule that combines in quick-reference form complete information needed for cutting any metal by hand or power hack saw and by metal cutting band saw is offered free on request by The L. S. Starrett Co., Athol, Mass.

Metal cutting slide rule

The slide rule is double sided. On one side is all essential information about hack-saw blades. When a slide is set to indicate the metal to be cut, the appropriate number of teeth per inch for hand blades and the correct pitch, speed and feed for power blades can be read instantly through clearly marked windows. Recommended tension readings for torque wrench and fixed tension devices are also provided.

The reverse side of the slide rule gives frequently needed information about band-saw blades. Setting the slide gives the correct length and width of blade for any standard band-saw machine and the recommended number of teeth per inch and the speed in f.p.m. for any material.

For brief reference use IAVE—1612.

WELDING BOOTH

To protect their health and provide more pleasant working conditions for welders is the purpose of this new fresh air, safety welding booth being planned for future production by The Hobart Brothers Company, Troy, Ohio.

The booth will be 9½ ft. wide, 9¼ ft. deep, and 7 ft. high. It is to be constructed of fabricated panels of 16-gauge sheet steel formed with companion flanges, punched on 12-in. center for bolting assembly. This type construction makes it easy to disassemble the unit to move to another

(Continued on page 39A)

NEW LESSON AIDS FOR WOODWORKING SHOPS

The saw guide also supports the back of the blade. Without this support, pressure against the material would force the blade out of line.

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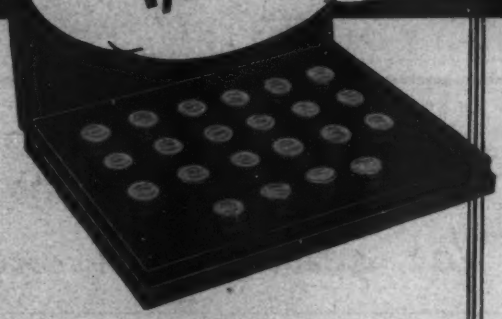
1,128 LIGHTED PICTURES



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Instruction — Review — Test

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3. Tool Grinder
4. Drill Press
5. Jig Saw
6. Band Saw
7. Disk Sander
8. Belt Sander
9. Lathe—Parts—Spindle Turning
10. Lathe—Faceplate Turning—Other Operations
11. Planer
12. Jointer
13. Circular Saw—Parts—Installing Blade
14. Circular Saw—Setting Up—Operating

BASIC SAFETY

1. Play Safe and Work Safely
2. Maintaining a Safe Shop
3. Safety Inspection
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★ Lighted illustrations—clear, sharp photographs or simple, graphic, professional drawings, done by experts—help teachers simplify and clarify the most complicated topics.

★ Pictures of small and intricate parts are shown in close-ups—greatly enlarged—so that all can see.

★ Pictures can be projected as long as needed . . . or changed as quickly as desired.

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ARTHUR SZYK ILLUSTRATION TAKEN FROM "ANDERSEN'S FAIRY TALES," PUBLISHED BY GROSSET AND DUNLAP, INC.

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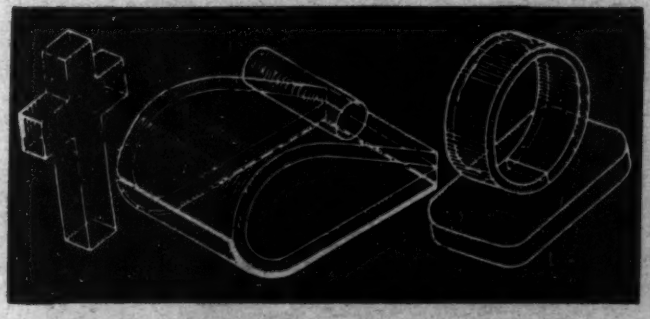

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Important new books for your school shop

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A new approach covering all phases—theory, maintenance and repair, and trouble-shooting. Exploded views. Latest practices. Text edition, $3.60

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Presents systems of production, interchangeability, and dimensioning as they pertain to tool design, basic machine tools, etc. Recent advances. $2.40

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Designed further to assist you is our free publication TECH TRAINING *devoted to research and training problems in vocational, industrial and business education.* Each issue will be loaded with helpful articles by prominent leaders in the field. (Be sure you are on our mailing list—see coupon.) This high-quality publication is our way of saying, "Thanks for the fine job you are doing."

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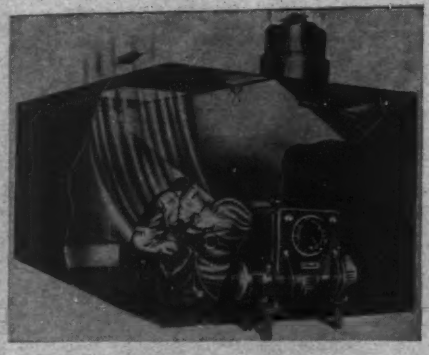


New welding booth

(Continued from page 36A)

location if desired. The door is of the sliding type with overhead track and easy running rollers, and measures 43 by 78 in.

The heavy duty exhaust fan draws in the fresh, cool air through an opening in the top, down past the operator to pick up welding fumes and heat, and then expells it to the outside of the building. In this manner, this booth serves a double purpose in providing fresh air and comfort to the welding operator, and at the same time protects fellow workers in other parts of the plant from eye-burn and welding fumes.

For brief reference use IAVE—1613.

ALL ALUMINUM GLASS CUTTER

Red Devil Tools, Irvington, N. J., has announced a new, lightweight, ball handle, All Aluminum Glass Cutter, model G 1.

Slightly less than half the weight of the cast-iron models, the Red Devil All Aluminum G 1 Glass Cutter provides a smooth, effortless cutting run with greatly increased sensitivity.

An additional important advantage of the all-aluminum handle is the fact that the G 1 is absolutely impervious to rust.

Aluminum glass cutter

The cutting wheel of electrically hardened and Chapmanized alloy steel is honed to a feather touch cutting edge that gives cleaner cuts with minimum pressure. The wheel, too, is absolutely rustproof. The oversize bronze bearings give increased smoothness in operation and maintains perfect wheel alignment.

For brief reference use IAVE—1614.

COATED ABRASIVES AND PLASTICS

A very informative 16-page booklet, "Coated Abrasives in the Plastics Industry," has just been published by Behr-Manning, Troy, N. Y.

Part I presents a simplification of the basic family types and numerous trade names under which plastics are made, explains the differences between the various types of plastics, and compares this medium with such substances as metal, wood, glass, and leather. It also explains the principal fabrication methods.

Part II is devoted to an explanation on how to sand and finish plastics, the kind and grit to use, whether to use wet or dry sanding methods, what kind of sanding equipment to use, and how to do the final buffing of the finished piece.

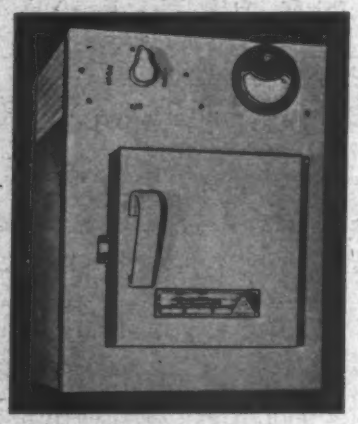
The book also contains a plastics reference chart which gives the names, properties, uses, and sanding practices of the rigid types of plastics. The same information is also contained on a 31 by 21¼-in. chart which may be used as a wall display. This last mentioned chart accompanies the booklet.

For brief reference use IAVE—1615.

NEW TYPE HEAT-TREATING FURNACE

A new versatile heat-treating furnace for small workshops and laboratories, utilizing temperatures up to and including 1850 deg. F., has just been placed on the market by the Pereny Equipment Co., 842 N. Pearl St., Columbus, Ohio.

This new furnace, known as Pereco Model 220-W, is applicable in plastics, heat-treating of metals, porcelain enameling, jewelry enameling, laboratory control work, and ceramics.



Heat-treating furnace

It is especially useful for hardening, annealing, drawing, carburizing or melting metals; preheating high speed steels, melting or annealing glass, and ceramic firing. It also embraces within its field of work the baking of enamels to metallic surfaces.

It is well insulated; has a wall-thick hinged door, and has resistance wire wound embedded

(Continued on next page)

GET A WEAPON YOU CAN WIELD

In days of old when knights were bold
They fought with lance and steed, we're told.
If knighthood were in flower again
And contests fought with brush and pen,
The knight most sure to win his bout
Would wield a Speedball, strong and stout

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ARE THE EASIEST TO USE TOOLS EVER DEVISED, and their low cost recommends them for both school and commercial use

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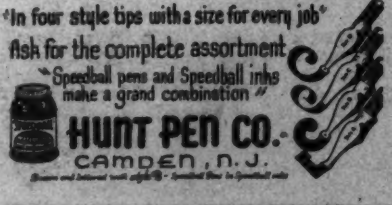

HUNT PEN CO.
CAMDEN, N.J.

(Continued from previous page)

elements for heating to its high temperature. It operates on 115 volts and draws 1500 watts.

For brief reference use IAVE—1616.

AN INTERESTING BOOKLET

A new 8-page booklet (B-1049) entitled "Norelco Diamond Dies," has been announced by North American Philips Co., Inc., 100 East 42nd St., New York City.

The text material describes how diamond dies are made for modern industrial applications; how the window method for precision drilling is used; steps in making the indenture, the cone, and the channel; differences in dies designed for hard, half-hard, and soft wires; and techniques of polishing, recutting, and setting. There are tabulations which give the points to look for in selecting a good die together with the types of dies to avoid.

The booklet is illustrated with 12 photos and 10 drawings.

For brief reference use IAVE—1617.

CATALOG OF CARBIDE STEEL MILLING MACHINES

The Kearney and Trecker Corporation, Milwaukee 14, Wis., has recently released catalog CSM-20 on their carbide steel milling machines.

This knee-type CSM machine is available in both horizontal and vertical models in 20, 30, and 50 h.p. sizes.

The catalog is profusely illustrated in color and contains much descriptive matter on the various sizes and types of milling machines that make up this line.

For brief reference use IAVE—1618.

STANLEY ACQUIRES NORTH BROTHERS MANUFACTURING CO.

R. E. Pritchard, president of The Stanley Works, announced recently that transactions had been completed whereby Stanley will on May 1, 1946, acquire the business and plant of the North Brothers Mfg. Co., of Philadelphia, Pa., manufacturers of the well-known line of Yankee Tools.

Ralph H. North and Seldon G. North founded the North Brothers Mfg. Co. in 1880 and acquired a plant in Philadelphia, in 1892 where their manufacturing operations have since been conducted. The plant has been expanded from time to time and now has approximately 160,000 square feet of floor space and employees numbering 400.

The North Brothers Mfg. Co. will continue to operate in Philadelphia with the same equipment and personnel. Management will be under the direction of M. A. Coe, general manager of Stanley Tools. Messrs. Weierstall and Fegley, North Brothers officials, will continue their association as vice-presidents of the new corporation of the same name formed by Stanley to produce Yankee Tools.

All orders and correspondence regarding "Yankee" Tools should continue to be addressed to North Brothers Mfg. Co., Lehigh and American Ave., Philadelphia 33, Pa.

A NEW SUBSIDIARY

The Milton Bradley Company of Springfield, Mass., has purchased the stock and good will of Edward E. Babb & Co., Inc., of Philadelphia, Pa. They will continue the business as a subsidiary under the name of Edward E. Babb Company of Pennsylvania.

NEW STARRETT DIAL INDICATOR CATALOG

A completely revised third edition of the Starrett Dial Indicator Catalog has just been produced and is available on request from The L. S. Starrett Co., Athol, Mass. It contains complete descriptions and illustrations of the many standard Starrett Dial Indicators together with information about other Starrett Indicators such as inside and depth dial gauges, vibrometers, cylinder gauges and dial gauges for measuring the thickness of metal, fiber, cloth, paper, and other materials in sheet form. The catalog also includes complete information on American Gage Design Committee specifications as well as descriptions and illustrations of the popular line of Starrett *Last Word* Dial Indicators.

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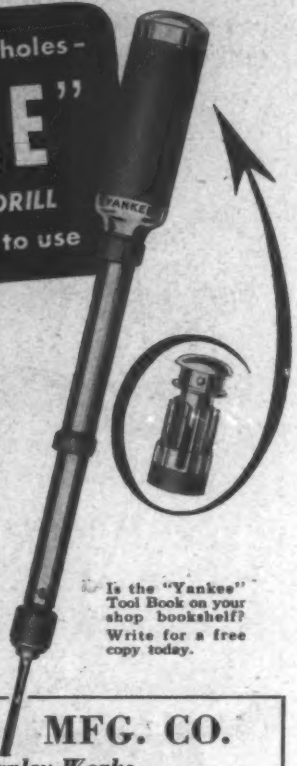

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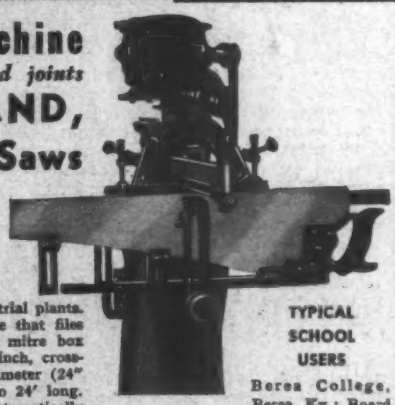

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(Continued from page 35A)

The New York City apprenticeship program for electricians has now employed about 500 apprentices, of which almost 90 per cent are veterans. The apprentices that were graduated on this occasion numbered 44, of which 32 are former servicemen.

♦ To enable the U. S. Office of Education to improve its service to American education, a committee to be known as the Citizens' Federal Committee on Education has been established.

The purpose of the committee is to advise the U. S. Commissioner of Education on policies and on programs of service to education to be carried on by the U. S. Office of Education. Sessions will be held in Washington, D. C., and the first meeting will be called in March, 1946.

Membership in the newly established committee is made up of persons designated by the presidents of a number of organizations, acting on a request made by Administrator Miller. The term of each member is 3 years, and one third of the membership is to be appointed each year.

U. S. Commissioner of Education, John W. Studebaker, pointed out that the committee would represent "the people throughout the country who establish and support schools and colleges." In general, he stated, the membership of the Committee is to be representative of labor, business, agriculture, manufacturing, homemaking, professions, veterans, Negro and religious groups (one representative each of Protestant, Catholic, and Jewish groups).

♦ On the evening of February 7, 1946, at the annual banquet of the American Vocational Association, Buffalo, N. Y., Dr. J. C. Wright delivered an inspiring and thought-provoking address entitled "Forty Years in Vocational Education."

Through the efforts of Dr. Frank H. Wing, associate superintendent of schools in charge of vocational education, and William C. Kamprath, principal of the Burgard Vocational High School, Buffalo, N. Y., this address was printed by the Burgard Vocational High School Press. The excellent booklet produced by students enrolled in our vocational schools is a fitting and proper tribute to Dr. Wright and his many years of tireless and unselfish service to the cause of vocational education.

♦ Henry Valve Company, 3260 W. Grand Ave., Chicago 51, Ill., has announced the publication of educational wall charts now available without cost to colleges, trade schools, and manufacturers' service schools. These charts feature large, clear cross-section views of typical accessories used in refrigeration and air conditioning; the text is factual and informative; the charts contain no advertising.

New Publications

Wonders in Wood

By Edwin M. Wyatt. Paper cover, 76 pp., 6 by 9 in., illus., 75 cents. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

A delightful book for anyone who likes puzzles in wood. There are 46 of these puzzles to tempt the craftsman, and they are all interesting to the maker, and mystifying to the onlooker.

Simplified Architectural Drawing

By Truman C. Buss. Cloth, 258 pp., 8½ by 11¼ in., illus., $4.75. American Technical Society, Chicago, Ill.

Prepared for the student on the secondary school level, this book presents the techniques required by the architectural draftsman, a short history of architecture, how to make working and construction drawings, and detail and display drawings.

The 167 problems which the book contains are gathered into a section at the end of the book.

Modern Metalcraft

By John L. Feirer. Cloth, 288 pp., 5⅝ by 8½ in., illus., $3.50. The Manual Arts Press, Peoria 3, Ill.

This book contains specific directions on how to use the tools and equipment in performing the numerous operations commonly associated with metalworking.

The author suggests that the student may make some of the tools and equipment needed to make the 33 projects illustrated and described in the book.

How to Read Statistics

By R. L. C. Butsch. Cloth, 184 pp., 5⅜ by 8 in., illus., $2.50. The Bruce Publishing co., 540 North Milwaukee St., Milwaukee 1, Wis.

A book describing how statistics may be interpreted. It is nontechnical and does not stress how to make the computations involved in the data presented. The emphasis is placed rather on the *why* and *what* of statistical presentation.

A Business of My Own

By Arthur E. Morgan. Paper cover, 184 pp., 6 by 9 in., $1. Community Service, Inc., Yellow Springs, Ohio.

A book suggesting possibilities, and furnishing informative information on numerous types of business ventures, of interest especially to those who intend to enter the business world. The author has rightfully limited the space given over in his book to such overcrowded fields as the food stores, gas stations, and canning plants. It is a book the G.I. could read with much profit before determining to go into business for himself.

Publicity Primer

By Marie D. Loizeaux. Paper cover, 101 pp., 5⅛ by 7⅝ in., $1. The H. W. Wilson Co., New York City.

The third edition of this helpful book which helps librarians solve their problems on how to set up an efficient publicity program.

The book tells all about preparing the copy for the local newspaper; how to set up book exhibits, posters, window displays and exhibits; and how to make the best use of the movies, the radio, operas and symphonies, and lectures.

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(Continued on page 46A)

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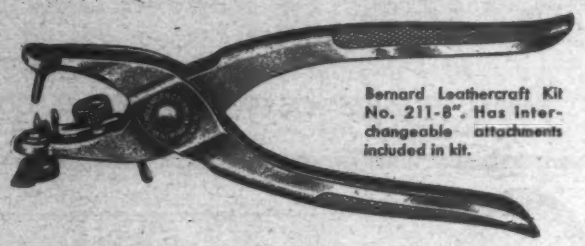

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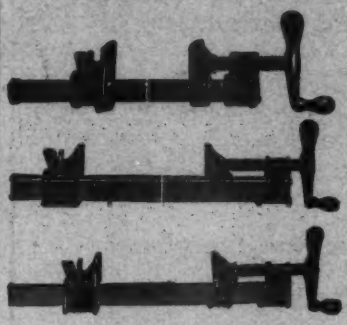

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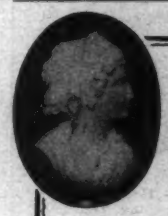

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(Continued from page 42A)

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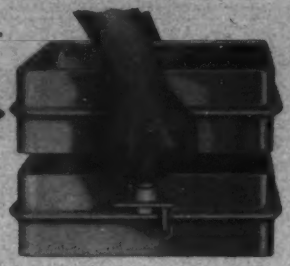

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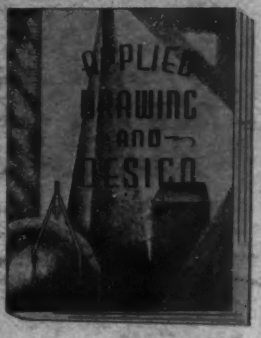

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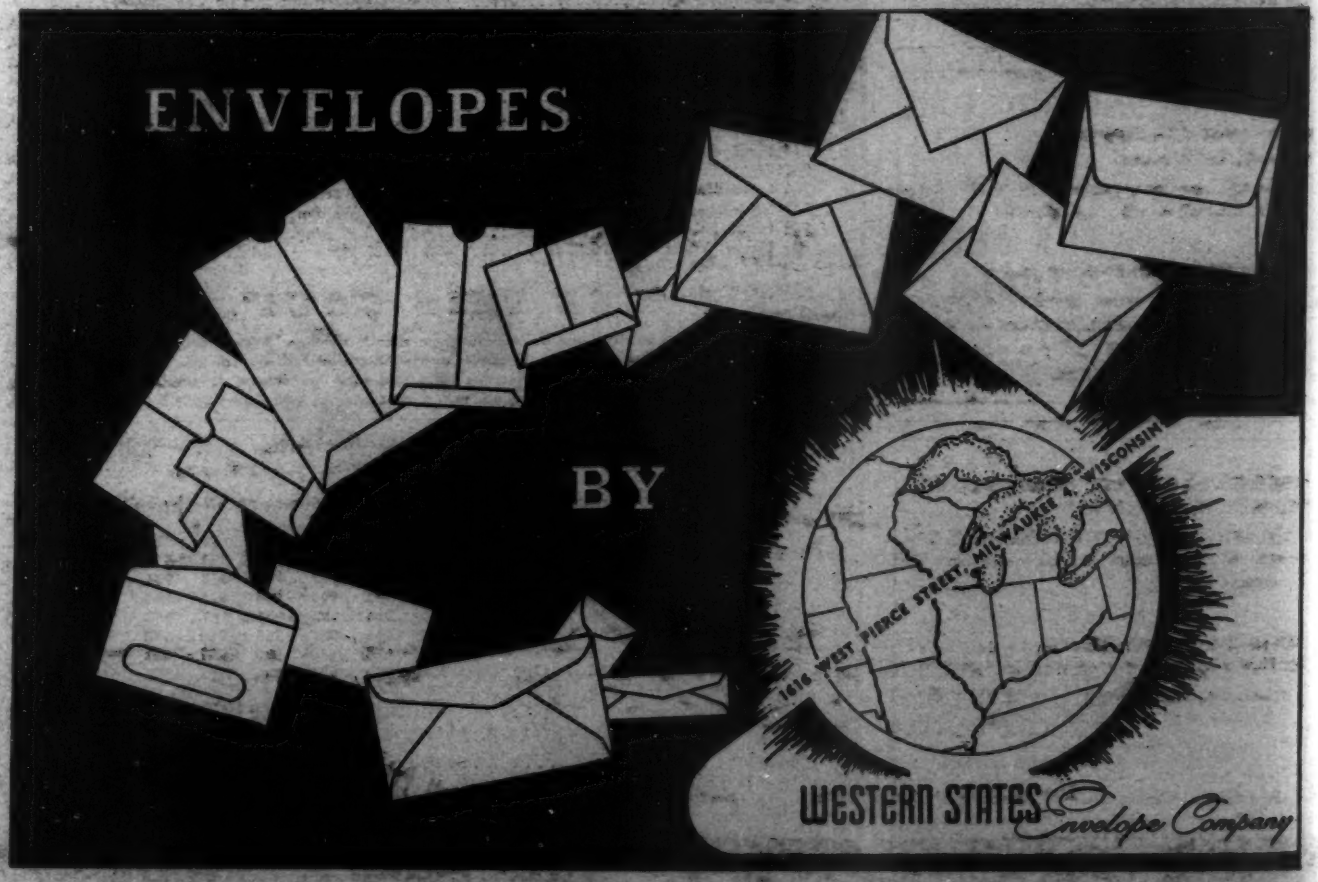

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